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ABSTRACT

This publication is a comprehensive report on the George Engelmann Mathematics and Science Institute's Scholar Research Program (SRP) and its activities in 1993. The SRP provides high school students who have successfully completed an earlier Engelmann program the opportunity to experience and practice the active components of the scientific enterprise in a real, ongoing research program conducted under the mentorship of an established scientist or mathematician. The report first presents basic information such as the program's mission statement, names of members of an advisory council, and a general program description. The following section gives detailed description of the SRP program, its goals and objectives, its disciplinary focus, and activities held throughout the year. These events include orientation, research experiences, seminars, career conferences, and a young scholar confirmation ceremony. The report also describes details of a program evaluation and presents a summary of student and mentor responses. Among the evaluation findings were overwhelmingly positive student and mentor responses to direct research lab experiences. Appendixes contain copies of relevant schedules, program formats, lists of participants, syllabus, series speakers, activity announcements, lists of student research papers, confirmation ceremony program and certificate, and student and mentor evaluation questionnaires. (JB)

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ED 370 465

1993 Annual Report

GEORGE ENGELMANN MATHEMATICS & SCIENCE INSTITUTE

Scholar Research Program

ΗΕ027 237

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THE ENGLEMANN INSTITUTE
A Partnership to Enhance Science and Math Education

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The George Engelmann Mathematics & Science Institute

Scholar Research Program
Annual Report
1993

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GEORGE ENGELMANN
MATHEMATICS & SCIENCE
INSTITUTE

MISSION STATEMENT

To enhance the understanding of the philosophy and processes of science and mathematics in high potential students and promote career interest in scientifically-oriented fields through integrating scholarly, social, and applied experiences developed through a partnership among schools, businesses, governmental agencies, and institutions of higher learning.

George Engelmann Mathematics & Science Institute
Scholar Research Program
1993

EXECUTIVE SUMMARY

The challenge of preparing our nation's youth for the demands of the work place in the 21st century could not be more compelling. More than ever, we require talented professionals who are highly skilled in math, science, engineering and related technical fields in order to retain our competitive edge as a nation.

Through a comprehensive partnership among schools, businesses, governmental agencies and institutions of higher education, the University of Missouri-St. Louis is responding to this critical challenge through a sophisticated and innovative array of precollegiate programs, which includes the prestigious George Engelmann Mathematics & Science Institute as a capstone. The Institute, launched in 1988, has become one of the most dynamic and successful precollegiate programs in St. Louis. It is also unique to the St. Louis community--and possibly the nation--because of its exclusive focus on math, science, and engineering, the instructional approach it takes, and the complex network of supporting relationships between community schools, St. Louis science based corporations, and three major research universities.

The goals of the Scholar Research Program (SRP) are to provide the opportunity for students who have successfully completed the first level George Engelmann Mathematics and Science Institute program or the Missouri Scholars Academy to experience and practice the active components of the scientific enterprise in a real, ongoing research program. This activity is conducted under the mentorship of an established scientist or mathematician in the areas of astronomy, biology, chemistry, earth science, engineering, mathematics (theoretical or applied), meteorology, physics, psychology, or statistics.

The overall project design for SRP is taken from the typical graduate student training format. There is a major emphasis on the development of the skills associated with successful independent research. Other activities during the six week experience included the science seminar series, communications, career confab, collaborative, and informal social interactions.

The final day required the submission and oral presentation of the student's research paper. The confirmation ceremony brought public recognition for the success experienced by the Engelmann Institute class of 1993 NSF Young Scholars.

Prior to the onset of the program, students were given a series of standardized tests to measure their attitude towards science, understanding of the scientific enterprise, and science research temperament. Following the Institute activities, corresponding post-tests were administered. As the data in the following report indicates the program is achieving its objective of enhancing the students' understanding of the philosophy of science and the total scientific enterprise.

In addition to the above quantitative measures, an evaluation was conducted at the program's conclusion to assess the effectiveness of each program component, as well as the Institute's overall impact. These findings are also presented in the following pages. The most significant experience the participants had, included the challenges of research and working with mentors, self-improvement, and interpersonal development. The benefits mentioned most often were the opportunities the Institute provided to perform actual scientific research and interact with their mentor and the write up and formal presentation of their research findings. As one student noted, "Working with university faculty and writing a research paper acquainted me with 'college life' in a fun and unique way."

Most mentors indicated students participated fully in the day-to-day dynamics of their research lab and became proficient in laboratory techniques, research methods, and in the operations of technical equipment. Mentors indicated that the greatest strengths of the Scholar Research Program were the challenges of the hands-on research activity and the quality of the students.

With each passing year, the visibility of the Institute is increasing as these positive experiences in mathematics and science are made accessible to the best and brightest students that St. Louis has to offer. The Engelmann Institute fills a niche in the community for the encouragement, support and development of precollegiate youngsters who promise to be leaders in technically based careers. The program's long-term impact can be measured by the impressive accomplishments of its alumni. Specifically, of the Engelmann Scholars who have graduated from high school to date, all are currently attending college, and 91 percent of these are pursuing science related careers as they enter the work force.

Clearly, the George Engelmann Mathematics & Science Institute is achieving its major goals. We are immensely grateful for the generous support that ensured a successful 1993 summer program and are proud to present the following report detailing the program's accomplishments.

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THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE

PROGRAM DESCRIPTIONS

I (SSP)
SCIENCE SCHOLAR PROGRAM

- 52 Jr. or Sr. High Students.
- 4 weeks summer experience.
- philosophically and theoretically based.
- Advanced traditional lab experience.
- Instrumentation and process focused.

II (SRP)
SCHOLAR RESEARCH PROGRAM

- 35 rising Sr. H.S. students.
- 6-7 weeks summer experience.
- Application of philosophy and technique in research lab setting.
- One-to-one mentoring.
- Career investigation.

III (AYP)
ACADEMIC YEAR PROGRAM

- 400 Engelmann Scholars and guests.
- Monthly meetings during school year.
- Highly career oriented with maximum exposure to a variety of research based institutions and corporations.
- Research Seminars and Forums.
- Socialization experiences.

IV (CASE)
COOPERATIVE FOR ADVANCED STANDING EXPERIENCE

- Open to all Engelmann, Missouri and N.S.F. Scholars.
- Available all year.
- University courses open to H.S. Sr. via dual enrollment.

V (CAES)
COLLABORATIVE FOR APPLIED EXPERIENCES IN SCIENCE

- Open to all Engelmann Alumns
- 75 College Students and 25 employers.
- Summer jobs program.
- Apply academic background to work-a-day research activities for renumeration.

Figure 1a. The Five Components of the Engelmann Institute.

PROGRAM LINKAGES AND STUDENT FLOW

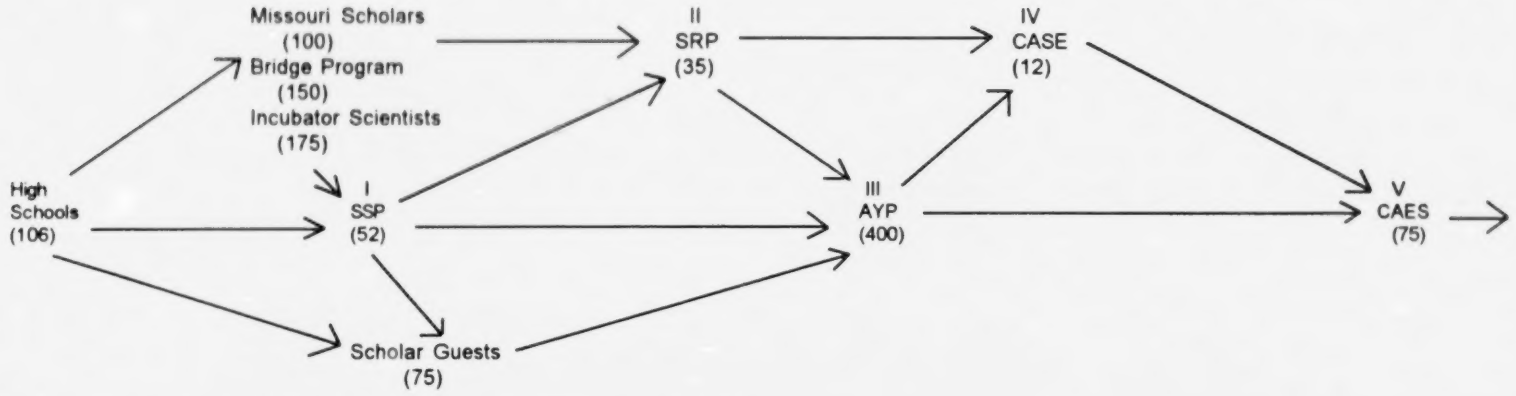

Figure 1b. The Pathways of Student Flow in the Engelmann Program Pipeline.

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THE GEORGE ENGELMANN MATHEMATICS & SCIENCE INSTITUTE

Scholar Research Program

Annual Report

1993

INTRODUCTION

The Engelmann Institute is composed of a series of five programs in a collaborative effort involving three major research universities, six foundations and 25 private sector research-based companies. This partnership annually provides more than 500 students from the St. Louis area with an introduction to various aspects of the scientific enterprise. A pipeline of activities, has been constructed to meet the academic and socialization needs of students of high potential running from their sophomore year in high school through their collegiate experience. Figure 1. illustrates the interconnections of all five of the Engelmann programs.

Through the support of the National Science Foundation's Young Scholars Program, the University of Missouri-St. Louis, in partnership with St. Louis University and Washington University has developed an innovative program called the Scholar Research Program. This six-week program, begun in 1990, was designed for graduates of the Engelmann Institute's Science Scholar Program or Missouri Scholars Program. Engelmann II, as it is designated, provides an intensive summer experience in math and science to selected seniors from 106 public, private, and parochial high schools in the greater metropolitan St. Louis area. As such, the Scholar Research Program emphasizes individually mentored student research and extends the academic activities and philosophical framework of the first level summer Science Scholar Program.

PROGRAM GOALS & OBJECTIVES

The goals of the Scholar Research Program (SRP) are to provide the opportunity for students who have successfully completed the George Engelmann Mathematics and Science Institute (University of Missouri-St. Louis) or the Missouri Scholars Academy (University of Missouri-Columbia) to experience and practice the active components of the scientific enterprise in a real, ongoing research program under the mentorship of an established scientist or mathematician in the areas of astronomy, biology, chemistry, earth science, engineering, mathematics (theoretical or applied), meteorology, physics, psychology, or statistics. The specific objectives of the Scholar Research Program are to:

1. enhance student knowledge of current topics in mathematics and science;

2. allow participants to fully explore one or more scientific problems;

3. integrate students into the dynamics of the working research environment;

4. allow participants to practice basic laboratory techniques in an open-ended, problem solving setting and learn the operation of a variety of technical equipment;

5. provide exposure to a wide variety of career opportunities in science and technology;

6. instruct students in technical wiring and the preparation of formal scientific papers;

7. train students in the skills of oral presentation of scientific papers;

8. provide students with the opportunity to experience the scientific enterprise, including the methodology, aims, and the nature of the scientist;

9. provide participants with the opportunity to interact with peers of similar academic and career interests, reinforcing their goals and achievements; and

10. provide participants with assistance and support for continued work on independent student research projects.

These goals and objectives are in-depth extensions of the objectives of the Science Scholar Program (SSP) program with major applied, independent components. SSP has as its underlying theme the history and philosophy of science. It is an introduction to scientific thought, research design, statistical analysis, and modern laboratory procedures. The Scholar Research Program (SRP), the second level, provides the opportunity to apply the knowledge and skills gained in SSP by doing real research under the supervision of a professional practitioner. Students invited to attend the SRP must be in the upper 5% of their class and have outstanding recommendations from their science or mathematics teacher and counselors. Eighty-four schools have been active in the SRP program over the four year period of its existence. Fifty-seven percent of the participants were female and 15% were minority. All students ranked in the upper 3% or better of their class scholastically. Table I provides some statistics regarding the nature of the participant populations from the 1990 through 1993 SRP programs.

TABLE I

ENGELMANN SCHOLAR RESEARCH PROGRAM Participant Statistics					
Parameter	Number of Students Year				
	1990	1991	1992	1993	TOTAL
N	14	20	32	37	103
Sex					
Females	6	11	21	22	60
Males	8	10	11	15	44
Ethnic Group					
African-Amer.	5	4	1	6	16
Asian	1	3	8	6	18
Caucasian	12	14	21	25	72
Hispanic	0	0	1	0	1
Source					
Engelmann Scholars	7	10	10	12	39
Missouri Scholars	7	10	22	21	60
Other Programs	0	0	0	4	4
Number of Schools	12	18	25	29	84

DISCIPLINARY FOCUS & ACTIVITIES

The overall project design for SRP is taken from the typical graduate student training format. There is a major emphasis on the development of the skills associated with successful independent research. However, the mechanics for introducing and practicing these skills incorporates a much closer guidance relationship with the scientist mentor and a more social and less independent relationship with participant peers.

The SRP program has five major components: 1) Research Component; 2) Science Seminars Series; 3) Communication; 4) Career Confab; and 5) The Collaborative. These components build on the activities that the selected students experienced the previous year as participants in the George Engelmann Mathematics and Science Institute or the Missouri Scholars Academy. The Institute provides intense study of the history and philosophy of

science and introduces research design methodology and the statistical treatment of data. Laboratory activities are limited to those involving structured formats with few open-ended opportunities. The complete schedule of SRP activities is presented in Appendix A and shows the nature of each activity and how it fits into the overall program. A "Definition of Activities" page follows the schedule and defines the nature of each activity.

The Academic Year Program (AYP) continues the activities of the Engelmann Institute throughout the school year and compliments both the Engelmann I summer program, "Unifying Concepts in Science," and the second level Engelmann Scholar Research Program, "Experiencing the Scientific Enterprise." The AYP activities address the expressed continuing needs of the Engelmann Scholars by bringing the high school students and their peers together to discuss timely scientific topics and career opportunities with leading researchers. These monthly interactions continued the positive relationships developed during the summer Institute among faculty, students and peers and reinforces the Scholars' confidence in their competence and enthusiasm for academic excellence. Ten monthly programs were held September through June. Each program included a scientific seminar, career activities and presentation, student research discussions, and social interactions. A sample program announcement and a list of activities is attached as Appendix B.

Orientation

On June 13, 1993, students, parents, and guests were invited to an Orientation Program (see Appendix C) on the UM-St. Louis campus. Dr. Roosevelt Wright Jr., Vice Chancellor for Academic Affairs, UM-St. Louis provided the welcome and Dr. Rickey George, Interim Dean, School of Education, UM-St. Louis, provided the greeting. Dr. Charles Granger, Director, Engelmann Institute, presented the goals/objectives and the curriculum overview, and Dr. George Engelmann (1809 to 1884) in the person of Dr. Steven Rowan, Professor of History, visited briefly and provided the audience with recollections of his research and scientific contributions. A reception in the atrium of the Science Complex followed.

Research Component

The SRP goals are to allow participating students the opportunity to conduct a semi-independent research project in their choice of science, mathematics, or engineering disciplines. Within these broad areas, the students' choices were limited to the expertise of faculty and corporate research consultants. Appendix D lists the Saint Louis University, Washington University, and University of Missouri-St. Louis faculty who volunteered for this program along with their research interests. These faculty members served as mentors for students and presented seminars in their area of expertise. In addition, Monsanto Company, Searle (a Monsanto subsidiary), McDonnell Douglas Corporation, and Emerson Electric Company identified research consultants to provide an outside resource for student research projects and seminar topics. The major subject matter focus for the individual participants was student driven to the extent allowable by the available personnel.

The program is not limited to a simple discipline or narrowly defined subject matter area. On the other hand, it cannot be labelled a true multi-disciplinary experience because an intense effort is focused on the research problem and accompanying paper prepared by the student. The common thread that underlies the generalized experience for each participant is the philosophy, mechanics, and social interaction of the total scientific experience.

The major time commitment was to the Research Component. Students devoted a minimum average of five hours a day for five days each week in a research environment, whether it was at the bench in the laboratory, in the field, or in a computer facility. Students chose a research project of interest within the area of expertise of one of more than 40 participating scientists. Under the guidance of the chosen mentor scientist, the student experienced various approaches to problem solving and had the opportunity to practice these approaches in an independent manner.

Because each student had an individual experience keyed to their choice of a research topic and the specific mentor, a universal activities program could not be developed. However, all students were responsible for developing the skills needed to: 1) complete a comprehensive library background search; 2) demonstrate theoretical reasoning in establishing problems and formulating hypotheses; 3) prepare an appropriate research design to test a hypothesis involving recognition and control of variables; 4) gather data in an organized, systematic manner; 5) apply one or more forms of statistical analysis; 6) use probabilistic and correlational reasoning to interpret observations; 7) draw appropriate conclusions using induction and deductive reasoning patterns; and 8) prepare and present a research based scientific paper.

Each student participated fully in the typical activities of the laboratory they chose. They learned requisition procedures, basic maintenance techniques, general administrative procedures, and appropriate social and behavior patterns for effective group or cooperative problem solving efforts.

Science Seminar Series

The most traditional instructional component of the program was the Science Seminar Series. Regular faculty members and other researchers in the community presented 11 seminars in areas of their research interest. The format was similar to the typical university seminar. Seminar speakers and their topics are presented in Appendix E.

More than twice as many faculty volunteered as was needed for the Science Seminar Series. The choice of presenters was based on an equitable distribution among the broad discipline categories, degree of expression of the processes of science, and the relevancy and topical nature of the subject, and their role model projection.

Communication

In addition to the science disciplines, a communications component was woven throughout the program. Students had formal class instruction in technical writing and presented a research paper on the topic that they completed with their mentor.

A formal course on technical writing and oral presentation was presented by Dr. Terry Martin, Senior Lecturer in the Dept. of English at UM-St. Louis. The course met for 18 contact hours throughout the six-week program. Appendix F details the course of study for the communications component.

All participants prepared and presented a research paper pertaining to their independent research project. Student achievement on both the written paper and oral presentation were used to assess the growth in technical communication skills of each student and the overall effectiveness of the program. The research presentation was made on the last day to peers, parents, and faculty.

Career Confab

The Career Confabs were an extension of the career exploration activities started during the 1992 Science Scholar Program. During the SRP some of the confab leaders were drawn from research institutions outside of the University. Seven major presentation topics scheduled this year included aeronautical engineering, atmospheric science, biology, chemical engineering, chemistry, physics, and virology. See Appendix G for a complete list of presenters.

In addition to the formal Career Confab component, there were very influential informal aspects to career education. This came into play as the students interacted with their respective mentors and other members of the research team in which they were working. This close, day-to-day association had the greatest and probably the most valid career learning effect on the students. During the Lab Rounds activity, students visited other research laboratories and saw a variety of career opportunities available. These experiences were shared among peers during the Collaborative.

Collaborative

The Collaborative was a biweekly session held during the first half-hour of each day. Students shared their progress, career interests, and perceptions of the effectiveness of the activities of the program. Library skills, word processing skills, and statistical analysis skills were reviewed on an as-needed basis. Any schedule changes or problems were discussed at this time.

NSF Young Scholar Confirmation Ceremony

The final day involved the submission and oral presentation of the students' scholarly research papers. Students had 10 minutes to present their papers and respond to questions from peers, mentors, faculty, and interested parents. See Appendix H for a list of research papers and Appendix I for the Confirmation Ceremony program and Certificate. The Confirmation Ceremony brought public recognition for the success experienced by the scholars and a challenge address from Dr. Joseph E. Wall, Vice President for Technology, Emerson Electric Company congratulated them on their achievements and outlined future societal expectations. A reception for the newly commended National Science Foundation Young Scholars followed the ceremony.

EVALUATION

Data Collection and Processing

At the completion of the Scholar Research Program all students were asked to complete a comprehensive Program Evaluation Questionnaire which sought their views about various aspects of their experiences. The Questionnaire was reviewed with all the students during Collaborative and questions answered at the time. The students were given the following directions concerning the Questionnaire: "The Institute would like to obtain your views about various aspects of the Engelmann program. It will help refine the program as we plan for future years and a new group of scholars. Please be candid. RANK (1=highest and 12=lowest) and EVALUATE (1=low and 5=high) each of the following activities. Your comments are critical to our understanding of your evaluation. Please write your feelings as much as possible in the comment space provided." See Appendix J for a copy of the Questionnaire.

Students were asked to take the questionnaire home and complete it during the week following the Institute. Thirty-two of the Research Scholars returned their questionnaire for 87% response rate. Coding schemes were developed and all quantitative data was transferred to computer disc for analysis. Responses to opened-ended questions were transcribed and content analyzed.

In addition, a Research Faculty Mentor Questionnaire was administered to all participating scientists. See Appendix K for a copy of the mentor questionnaire. The results were analyzed using the same procedure as for the student questionnaire.

Data Analysis of Student Responses

Subjective Measures

For each item on the student follow-up questionnaire the means were computed for each activity and presenter, and then each activity was ranked from highest to lowest. When the mean rank of order of importance was compared to the rank for evaluation of each activity, no rank difference was greater than one, indicating a high correlation between the importance of program activities and their evaluation. The Individual Research Project and Written Research Paper ranked one and two for both importance and evaluation. Achievement Assessment ranked third for importance, followed by Social Activities, Collaborative, Science Seminars, Lab Rounds, Oral Presentation Practice, Communication, Career Confab, and last, Library and Computer Lab. See Table II for a summary of the activity rank order of importance, evaluation means, and corresponding ranks.

TABLE II

Summary of Activity Rank Order of Importance and Rank of Evaluation Means

Activity	Mean Rank Order of Importance	Rank	Evaluation Means	Rank
Ind. Research Project	1.52	1	4.79	1
Written Research Paper	3.76	2	4.31	2
Achievement Assessment	4.57	3	4.18	4
Research Paper			4.32	
Oral Presentation			4.10	
General Attitude			4.07	
Peer Cooperation			4.18	
Pre & Post Testing			2.79	
Social Activity	4.86	4	4.20	3
Picnic			3.71	
Observatory/Planetarium			3.57	
Baseball Night			4.19	
Pool Party			3.92	
Inf. Stu. Inter.*			3.86	
Science Center			4.61	
Night at the Movie			4.50	

Collaborative	5.41	5	3.83	5
Science Seminars	6.03	6	3.77	6
Armbruster			3.77	
Bellone			3.45	
Connett			3.43	
Fox			3.70	
Lehmkuhle			4.27	
Loui			4.07	
Marquis			3.67	
Miller			3.70	
Tang-Martinez			3.73	
Will			3.57	
Wysession			4.10	
Lab Rounds	6.76	7	3.73	8
Oral Presentation Practice	7.14	8	3.76	7
Communication	7.83	9	2.86	10
Career Confabs	8.07	10	3.31	9
Library & Computer Lab	9.03	11	2.76	11

*Inf. Stu. Inter. denotes Informal Student Interaction

The Individual Research Project in the laboratory of the mentor scientist ranked first and had an overall evaluation of 4.79 out of 5.00. Students indicated this activity was a great experience and that the mentor was the key factor in the experience. A few students indicated they would like to have more input in choosing their mentor.

Selected comments include:

- "A great experience and beneficial for college."
- "This type of individual experience is a good challenge and a good learning experience."
- "I'd like to return."
- "The experience of working in lab was great, but it also brought into mind the fallibilities of scientific results. People in the lab were very kind and generous and I had a very pleasant experience. I saw how so many things in procedures could have been done more efficiently. This experiment seemed overrun with possible human error. My only regret is that I wish the procedures were more accurate. Other than that, lab was awesome and I would do it over if I could."

- "Very important, although students had little say in choosing their mentor."
- "My mentor was cooperative, supportive, and very helpful in my rewarding research."

The Written Research Paper ranked second and had an overall evaluation mean of 4.31. Students indicated the support given by the Scholar Research Program advisor was helpful and important in their organization and development of the research paper. The specific requirements for the paper may need to be reviewed because of the diversity of the research areas.

Selected comments include:

- "Mr. Kardis was very helpful and informative."
- "A long process. Mr. Kardis' editing was very helpful."
- "Good way of showing what we learned."
- "More could be done for those whose papers did not fall into the problem/hypothesis/experiment category (i.e. survey papers)."
- "Encourage students to do background reading early."

Social Activity included a picnic at Shaw Park, an evening at the UM-St. Louis Planetarium and Observatory, an afternoon and evening at St. Louis Union Station, a night at the St. Louis Cardinal baseball game, and overnight at St. Louis Science Center and with a lecture/movie on Jurassic Park. Social Activity ranked third and had an overall mean of 4.20. Students indicated that social activities were needed, helpful, and a plus for the program. Perhaps more social interaction and break time should be programmed into the schedule. A few students indicated that social activities should not be required but encouraged.

Selected comments include:

- "With all the time spent alone researching, this was a definite plus!"
- "Enjoyable activities. They allowed you to get to know your fellow students outside of Research Scholar Program."
- "I enjoyed getting to know as many people as I could."
- "Sometimes it was difficult to attend."
- "Picnics need to be later in the program. More informal student interaction needed. Organize 'bonding' activities."

The Achievement Assessment includes the actual writing of the research paper, oral presentation of the paper, general attitude and peer cooperation, and pre and post testing. The Achievement Assessment ranked fourth and had an overall mean of 4.18. The sub-activity of pre- and post-testing evaluation of 2.79 indicated the students' dislike for standardized tests, and because the results were not reported to them, had little significance

or meaning. Next year, the importance and need for the data will be explained clearly and the results conveyed to the students in a timely manner.

Selected comments include:

- "I don't think that tests can accurately judge one's potential. They don't test how dedicated one is in what they pursue."
- "What a feeling of accomplishment when the paper and presentation were over! The paper is my masterpiece. Thanks for giving me the opportunity to write it."
- "Pre- and Post-test - what is the point? Could you explain the purpose for these tests in the future?"
- "Please put tests after presentations."
- "Tests were non-motivational. Answers didn't seem to reflect my true feelings."

Collaborative ranked fifth with an overall evaluation of 3.83. Students indicated the Collaborative was an essential and necessary component of the program. It provides a regular time for students to receive updated information concerning schedules and program expectations.

Selected comments include:

- "Updated you on the week's activities."
- "Necessary component."
- "Essential to keep up with what is going on. Could be better organized."
- "Updated calendar could be issued each week."

Science Seminars ranked sixth with an overall evaluation of 3.77. Students generally enjoyed the Science Seminars. They were seen as factual, informative, interesting, and gave the student an introduction to another area of science by a senior scientist of which the student had little, if any, knowledge.

Selected comments include:

- "Very interesting. I like learning about the different fields in science. Sparked interest in other areas."
- "One of my favorite parts of Engelmann - very informative and interesting and makes learning fun."
- "Very interesting. Maybe not so long."
- "There was so much material on the physical sciences. People like me who are mostly oriented to the biological sciences felt deprived on top of that."
- "Interaction with audience made for best seminars."

Oral Presentation Practice ranked seventh with an overall evaluation mean of 3.76. Students generally agreed that oral presentation practice provided helpful preparation for the formal presentation of their research findings. A few students stated that more time was needed. Students mentioned as well that their advisor, Mr. Kardis, was helpful and gave good ideas for their presentation.

Selected comments include:

- "Helped prepare students to feel more confident about their presentation."
- "Very helpful. Perhaps students should submit a copy of their speech at this time."
- "More time should be given to each student."
- "Helpful activity. Mr. Kardis offered good ideas on presenting my paper."

Other activities ranked as follows:

Laboratory Rounds ranked eighth with an overall evaluation mean of 3.73.
Career Confabs ranked ninth with an overall evaluation mean of 3.31.

Communication ranked tenth with an overall evaluation mean of 2.86.

Library and Computer Lab ranked eleventh with an overall evaluation mean of 2.76.

In addition to the Likert scale response questions, students were asked to respond to open-ended questions that sought information and opinions concerning program efficacy, enhancement, and efficiency.

The first question asked was "If you had to pick two activities to drop from the program, which would they be?" The most often mentioned activities and number of times mentioned were: Communication (13), Career Confab (11), and Library and/or Computer Lab (13). No other activity was mentioned more than three times. These responses are consistent with the above rankings.

The second question asked "If you could add any activity, what would it be?" Students mentioned they would like additional social activities (11), sports activities with Engelmann I participants (5), optional field trips (5), more group discussions (3), and special discussions/debates (2).

The third question asked "For your own development and understanding, which activity was most beneficial?" An overwhelming number of students (22) indicated their Research Experience and Interaction with their mentor was the most beneficial activity, followed by Writing and Presenting the Research Paper (6), Science Seminars (4), Communications (3), and Social Activities (3).

Selected comments include:

- "Research. Working in the lab is great. I learned about the hard work and fun. I hope SRP isn't my last lab experience."
- "Laboratory research. Working with university faculty and writing a research paper acquainted me with 'college life' in a fun and unique way."
- "Research experience. This was beneficial to me because it was a real college experience and the whole program challenged me to grow up and I think I did."
- "Research. It was a way for me to get experience and get an edge on other kids. It made me understand scientific methods better."

The fourth question asked "What would you change to make the program better?" The 25 responses to this question suggested a myriad of changes. Those responses mentioned two or more times included: more peer or group interaction (3), more social activities (3), more research time (3), change communications instructor (2), and eliminate confabs (2).

The fifth question asked "What is the most significant thing you got from the Engelmann Institute Scholar Research Program?" The responses were quite varied, but focused in three main areas: 1) The challenges of research/working with mentors, 2) improved knowledge of careers in science/research process opportunities and self improvement, and 3) interpersonal development.

Selected comments included:

- "Understanding of attitudes and perspectives."
- "Understanding careers in science and research opportunities."
- "The friendships I made. My friends are supportive, understanding, encouraging, and excited about my passion for science. The same goes for me about them."
- "Recognition of my ability and a high self-esteem."
- "I made friends that were excited about learning science, math, and other disciplines."
- "Experience of being in a lab and learning how to write a scientific paper. Research is hard."
- "I received the title of NSF Scholar and a sense of great achievement and more knowledge."

Eighteen students (58%) indicated the schedule of events was "just about right," 10 (32%) indicated it was "too free and open," and 3 (10%) indicated it was "packed too heavily."

Students indicated they would strongly recommend the Engelmann Institute to their friends. On a seven point Likert scale (0=Not at all and 6=Highest Degree) the students' mean rating was 5.07 out of 6.

Students rated the effectiveness of their research mentor as being extremely helpful and supportive. On a seven point Likert scale (0=Poor and No Help and 6=Extremely Helpful and Supportive) the students' mean rating was 5.41.

Based on their expectations, students were positive about their laboratory research experience. On a seven point Likert scale (0=Poorest Work of this Type and 6=Elated and Beyond) the students' mean rating was 4.80.

Overall the Engelmann Scholar Research Program rated very well. On a seven point Likert scale (0=weak and not worthwhile and 6=strongest such program in which I have participated) the students' mean rating was 4.90.

Twenty-seven students made final comments regarding the Scholar Research Program. Most of the comments focused in the areas that the program (1) provided a worthwhile and significant experience in science, (2) provided career information, and (3) allowed the student to gain insight into the scientific research process.

Selected comments include:

- "It is a great experience to learn, work in a lab, become acquainted with college life, and have fun while you're doing it."
- "Very beneficial, enjoyed immensely and learned a lot. Hopefully, this program continues for many years. It was a great experience. I'll miss it!"
- "Am glad I was given the opportunity to do research with a professor. I sincerely believe that I gained a lot of insights into the scientific research community and the education [process] behind change."
- "Excellent experience. I loved being involved with a program like this where everyone was supportive. I'm honored that I had the chance to take part in the Institute."
- "It was great, but took my summer away from me. I owe a lot to the people of Engelmann, maybe even my future."
- "I learned a lot, not just about science, but about being a scientist. This experience was priceless."

Objective Measures

In addition to the questionnaire data received from student participants, a battery of three separate research instruments were administered to the students in a pre-post evaluation design to test the effectiveness of the program. The areas of investigation included 1) attitude toward science, 2) the understanding of the scientific enterprise, and 3) the science research temperment of the students.

The Test On Understanding Science (TOUS) is composed of three subtests that measure the subject's understanding of what a scientist is and how science works. It consists

of 60 multiple choice questions with correct responses being given one point and no penalty for incorrect responses.

The Science Attitude Inventory (SAI) is a 60-item standardized questionnaire measuring the subject's attitude and interest in science. Subjects are asked to respond whether they "agree strongly," "agree mildly," "disagree mildly," or "disagree strongly." The questions are divided equally between negative attitudes and positive attitudes. For positive attitudes, subjects are given 3 points for agreeing strongly, 2 for agreeing mildly, 1 for disagreeing mildly, and none for disagreeing strongly. The scoring is reversed for negative attitudes (3 points are given for disagreeing strongly, 2 for disagreeing mildly, 1 for agreeing mildly, and none for agreeing strongly). The sum of all the points is the subject's score.

The Science Research Temperment Scale (SRT) by William C. Kosinar is a normitive instrument that matches words associated with personality traits to success in scientific research. High scores indicate the kind of traits associated with high achieving individuals. There are 42 pairs of word choices with a correct match gives one point. A perfect match of all items yields a maximum score of 42.

Statistical analysis of the Test On Understanding Science pretest/posttest measures using the "t" test of parametric repeated measures design indicated a mean difference of 3.515 and a SD of 4.86. A "t" value of 4.154 was significant at the .001 level. This result provides objective evidence that the program is achieving its objective of enhancing the students' understanding of the philosophy of science and the total scientific enterprise.

For the SAI test a paired sample "t" test was computed on 37 students pretest/posttest scores. A mean difference of 1.00 had a "t" value of -0.451 and was not significant.

The SRT scores are recorded in Table III. Neither the SRT or SAI changed significantly. One would not expect to see a change in personality traits over such a brief period of time. However, this data may be useful later to see if there is a correlation between SRT scores and success in a science or math field.

TABLE III

Changes in the Perceptions of Science By Engelmann Scholars

Category	TEST ON UNDERSTANDING SCIENCE			
	SCHOLAR RAW SCORES			
	N	Pre-Test	Post-Test	Difference
All E-II Participants	33	38.94	42.46	3.51**
Gender				
Females	19	37.37	40.84	3.47**
Males	14	41.07	44.64	3.57*
Previous Programs				
SSP[1]	11	38.09	41.09	3.0*
MoSch/Other[2]	22	39.36	43.14	3.78**

Category	SCIENCE ATTITUDE INVENTORY			
	SCHOLAR RAW SCORES			
	N	Pre-Test	Post-Test	Difference
All E-II Participants	36	132.90	133.9	1.0
Gender				
Females	21	133.90	130.0	-3.0
Males	15	130.53	136.73	6.2
Previous Programs				
SSP[1]	12	133.0	131.92	-1.08
MoSch/Other[2]	24	132.25	134.04	1.79

Category	SCIENCE RESEARCH TEMPERMENT SCALE			
	SCHOLAR RAW SCORES			
	N	Pre-Test	Post-Test	Difference
All E-II Participants	34	22.5[3]	21.50	-1.03
Gender				
Females	19	21.68	20.95	-.737
Males	15	23.64	22.36	-1.29
Previous Programs				
SSP[4]	11	21.36	20.55	-.81
MoSch/Other[5]	23	23.09	21.96	-1.13

[1]Science Scholar Program
[2]Missouri Scholar Academy/Other Programs
* Significant at the .05 Level
** Significant at the .01 Level

Data Analysis of Mentor Responses

At the completion of the Scholar Research Program all 36 research mentors were sent the Research Faculty Mentor Questionnaire. The questionnaire asked the mentors to respond to questions on a 7 point Likert scale and also gave them the opportunity to respond in depth to any questions they chose. A total of 32 questionnaires were returned for analysis.

Mentor scientists gave the overall Engelmann Scholar Research Program excellent ratings. The mean of 5.59 ranked first. Students "fully" participated in the exploration of research projects and, overall, mentors said the experience of having a high school student in their lab was "an outstanding opportunity." Some mentors indicated that they were impressed with how their "student jumped in" and/or "really knew what they were doing." "The student took charge of working with the data we received" was another comment. Almost all written comments were positive concerning the mentors' experience with the students. One mentor commented "this [6 week experience] is as great for us as it is for the student."

Most mentors indicated that students participated fully in the day-to-day dynamics of their research labs. One mentor mentioned "[she] became part of our team, especially during the last two weeks." Another mentor said "our environment is a bit more dispersed than most, but the students did attend some meetings and we worked one-on-one."

According to mentors, students became proficient in laboratory techniques, research methods, and in the operations of technical equipment. Comments included: "[She] learned by failing a few times, but then she really caught on" and "he showed good laboratory procedures in a carefully run study." One mentor commented that there just "wasn't enough time to learn more experimental techniques."

Mentors indicated that most students showed an understanding of the preparation and presentation of formal scientific papers. Each student must present their research findings to peers and faculty as requirements for completion of the SRP and to be named a National Science Foundation Young Scholar. The following comments summarize their feelings. "Paper well done--paper presentation needed a little work." "He followed the instructions for presentation carefully, however I thought the rules for presentation were too rigid." "[The student] was more confident than he should have been." "His writing skills improved over the summer--a real breakthrough." A mentor commented, "I do not think this can be achieved with the time constraints [of the program]."

Mentors indicated that students had obtained first-hand knowledge of the variety of opportunities in science and technology. Some mentors had lengthy discussions with their students and reviewed education options, careers, and their education requirements. The mentors mentioned that students frequently would discuss career options with graduate or post doctoral fellows.

When mentors were asked "Did your student perform as expected," 26 (87%) said "yes." Some mentors indicated that their student was even better than they had expected. However, one mentor mentioned his "student seemed preoccupied with other activities" and another mentor mentioned "it took a little effort to get his student motivated, but once motivated he did quite well."

Most mentors spent considerable time with their students. This time was often supplemented with the interactions of graduate students and research technicians. Twenty-five (78%) mentors spent at least 5-10 hours/week with their students and 10 mentors (33%) spent at least 11-15 hours/week with them.

Continuity of mentor interaction is important for students to make significant progress on their research project. During the six-week duration of the program, only five mentors were away or otherwise unable to interact with their student for more than five days.

Meaningful research projects usually require significant amounts of time to carry out. Research questions need to be defined, data collected, analyzed, and reports prepared. Still, 18 (60%) of the mentors indicated that six weeks was a reasonable time period to accomplish the goals of the program. However, there were requests for additional time, at least eight weeks, from several mentors.

Almost all (83%) of the mentors indicated the schedule was acceptable to them. A number of mentors did indicate that more time committed to laboratory research would be "better" or "ideal."

Although mentors and students spent considerable time in the research labs, additional activities and interactions did occur that were beneficial to the student and/or mentor. These activities included: (1) general discussions about a variety of topics, (2) personal time and going to lunch, discussion of needs and interests, (3) lectures to students and incoming graduate students, (4) visits to Monsanto's crystallography lab and the Department of Radiology at Jewish Hospital.

Mentors were asked what they felt was the greatest strength of the Scholar Research Program. The answers were usually focused on one of three areas. They were: (1) the challenge of the hands-on research activity, (2) the quality of the students, and (3) the overall experiences and quality of the program.

Selected comments include:

- "Getting students actively involved in ongoing research."
- "Hands-on experience and interactions with research scientists."
- "Growth of the student as she participated in research project."

- "Exposed a bright high school student to a laboratory where research is active and where people working on scientific problems are excited about what they are doing."
- "Talented students who are motivated and capable of working with little supervision."
- "Social occasions with similar students, access to working professional scientists, seeing what it is like to be a scientist."
- "The integrative nature of not only providing contact with a mentor, but help with writing research papers, exposure to research, and social activities."

In addition, mentors were asked what was the greatest weakness of the Scholar Research Program. A majority of the responses centered on the lack of time. Mentors felt that students need to spend more full days in the laboratory and the schedule needs to be less fragmented.

Selected comments include:

- "Short time to be able to really introduce the subject to a high school student."
- "Days are too broken up. It would be best if much of the outside activities happened earlier in the program."
- "Students do not spend enough full days in the research laboratory."
- "The research experience is too fragmented."

Extensive interaction with mentors is conducted before the program begins and additional interactions are apparently not needed. Mentors indicated that more dialogue between the program directors would not have been helpful.

About half (47%) of the mentors felt the students' research project had potential to be entered into a science fair, Westinghouse, or JSEH Symposium competition. Two-thirds of the mentors felt that their students had the potential to prepare and complete a project for competition like a science fair.

Scholar Research Program student participants are among the best and most talented students in the greater St. Louis area. When mentors were asked to rate the overall ability of their student with respect to other high school students or entering college freshmen, 28 (88%) students were judged to be in the upper 10%, and 13 (41%) were judged to be at least in the upper 2%.

Mentors were asked to rank order the importance to the success of the program all of the areas that their student had undertaken or accomplished. As one might expect, mentors ranked laboratory or research activity first, followed by student interactions with scientists and laboratory personnel, and preparation of the research paper. Mentors see the most important aspect of the Scholar Research Program as the series of activities that directly relate to the investigation of a research problem and the analysis of the problem. Other areas

in rank order of importance were oral presentation of research findings, science seminars, attendance at formal scientific presentations, technical writing class, social activities, preparation of a log book, career confabs, and mentor-student social activities. See Table IV.

TABLE IV

Summary of Activity Mean Evaluation and Rank

Activity	Mean Evaluation	Rank	N
Laboratory/Research Activity	1.32	1	28
Interactions with Scientist & Lab Personnel	2.59	2	26
Writing of Research Paper	3.18	3	28
Oral Presentation of Paper	4.00	4	23
Science Seminar	4.67	5	18
Attendance at a Formal Sci. Presentation	5.33	6	15
Technical Writing Workshops	5.37	7	19
Social Activities	5.50	8	19
Preparation of a Log Book	5.53	9	17
Career Confabs	6.33	10	12
Mentor-Student Social Activity	7.23	11	13

Twenty-seven mentors mentioned that they were willing to serve as mentors for the 1994 Scholar Research Program, three said maybe, and one said no.

Mentors suggested seven colleagues who would be interested in participating next year as mentors. One mentor volunteered to personally circulate information to his colleagues and be an advocate for the program.

SUMMARY

The results of the evaluation procedures can be summarized as follows.

Student Responses

- The Individual Research Project, Written Research Paper, Social Activities, and Achievement Assessment were the most important activities in the program.

- There was a strong correlation between how students rank the importance and the evaluation of program activities.
- Participants would like additional social activities, sports activities with Science Scholar Program participants, optional field trips, and more group discussions.
- The research experience was thought to be the most beneficial part of the program.
- Program changes would include more peer or group interaction, more social activities, and more research.
- The most significant benefit students received from the program were the challenges of research/working with mentors, improved knowledge of careers in science, and interpersonal development.
- Students would strongly recommend the Scholar Research Program to their friends.
- Students rated the effectiveness of the mentor as being extremely helpful and supportive.
- Overall, the Engelmann Scholar Research Program was rated highly by the participants.

Mentor Responses

- Mentors gave the Scholar Research Program an excellent overall rating.
- Most mentors indicated that their students participated fully in the day-to-day dynamics in their research laboratory.
- Students became proficient in laboratory techniques, research methods, and in the operations of technical equipment.
- Mentors indicated that most students showed an understanding of the preparation and presentation of formal scientific papers.
- Almost all mentors indicated their student performed as expected. Some students exceeded the mentors' expectations.
- Twenty-five (78%) mentors spent at least 5-10 hours/week with their student.
- A majority (60%) of mentors indicated that six weeks was a reasonable time period to accomplish the goals of the program.

- Mentors feel that the greatest strengths of the program include the challenge of the hands-on research activity and the quality of the students, and the overall experience and quality of the program.

- The greatest weakness was the amount of time committed to research.

- When compared with other high school students or to entering college freshmen, 88% of the students were judged to be in the upper 10%.

- Mentors indicated that the laboratory experience, student interaction with laboratory personnel, and preparation of research paper were the most important activities for a successful program.

Through the cooperative effort of schools, businesses, governmental agencies and institutions of higher learning, the Engelmann Institute has been able to provide students with a unique opportunity to develop their academic backgrounds and interests in the sciences and mathematics. The focused support of the private sector has allowed the Institute to expand from one program in 1988, serving fifty students, to five programs serving more than 400 students. This has been accomplished through a systematic sequence of activities which provide for the students' academic and socialization needs from their sophomore year in high school through their senior year in college.

Both the subjective and quantitative assessment data indicate that the Engelmann Institute is a highly successful program for facilitating the flow of talented young people into technical fields. The Institute has developed a curriculum and administrative model that may be applicable to a multitude of settings. To this end, the Institute has been actively exploring the possibility of establishing additional program sites at Saint Louis University in the metropolitan area and statewide through a University of Missouri initiative that would bring programs to the other campuses in the University System, Columbia, Kansas City and Rolla. Through this partnership of support and continued cooperation from all sectors, the program could eventually serve more than 1,500 students annually. This valuable partnership of schools, businesses, governmental agencies and institutions of higher learning has provided the expertise and resources which have the potential to reverse the decline in the availability of a scientifically literate work force.

THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE

ACHIEVEMENTS

A. Publications and Presentations

Robinson, Donald W., Charles R. Granger, Barbara T. Holt, Doris A. Trojcak and Rickey George, "Partnerships for Progress - Project Compete," Industry and Higher Education, Vol., 5, No. 2, June 1991, pp. 79-86.

Granger, Charles R. and Teresa Thiel, Research Mentor's Handbook, University of Missouri-St. Louis Printing Services, 1991, 70 pp.

Granger, Charles R., Pamela Iverson, and Kenneth R. Mares, "The Engelmann Institute - Unifying Concepts in Science" Westminster College, Fulton, MO, MAS Bulletin, Vol. 19, No. 4, April 19, 1991.

Granger, Charles R. "Summer Program for Science Students," National Science Teachers Association Area Convention, New Orleans, LA. Dec. 20, 1991.

Granger, Charles R., Pamela Iverson, and Kenneth R. Mares, "The George Engelmann Mathematics and Science Institute - Phase II and Phase III." MAS Bulletin, Missouri Academy of Science, Rolla, MO, April 25, 1992.

Granger, Charles R., Pamela Iverson, and Kenneth R. Mares, "The George Engelmann Mathematics and Science Institute - Unifying Concepts in Science" Annual Missouri Academy of Science Meeting, Fulton, Missouri, April 20, 1991.

Granger, Charles R., Pamela Iverson, and Kenneth R. Mares, "The George Engelmann Mathematics and Science Institute - Unifying Concepts in Science" University of Missouri-Rolla, Rolla, Missouri, April 1992.

Granger, Charles R., Pamela Iverson, and Kenneth R. Mares, "The George Engelmann Mathematics and Science Institute - Scholar Research Program" Catholic Education Institute for the Archdiocese of St. Louis, Forest Park Community College, St. Louis, Missouri, March 8, 1993.

Rao, G. V., "Lightning as a Captivating Topic in a Study Program for the Gifted College Bound Science Student," 17th Conference on Severe Local Storms and Atmospheric Electricity, American Meteorological Society (AMS), St. Louis, Missouri, October 4-8, 1993.

Mares, Kenneth R. and Charles R. Granger, "The George Engelmann Mathematics and Science Institute," National Association of Partners in Education, Inc., National Symposium on Partnerships in Education, November 8-14, 1993, Arlington, Virginia.

B. Awards and Recognition

On November 15, 1990, the Business Higher Education Forum of the American Council on Education announced that the Engelmann Institute as part of the Partnership for Progress initiative was the first recipient of the Anderson Medal. Named after Robert Anderson, former chairman and CEO of Rockwell International Corporation, it was established to honor excellence in tripartite alliances among business, institutions of higher education and government agencies on the behalf of the precollegiate schools. (Industry and Higher Education, Vol. 5, No. 2, June 1991, pp. 79-86).

THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
SCHOLAR RESEARCH PROGRAM
"EXPERIENCING THE SCIENTIFIC ENTERPRISE"
Sponsored by the
National Science Foundation
in Partnership with
St. Louis University, Washington University and the University of Missouri-St. Louis
June 14 - July 23, 1993

SCHEDULE OF ACTIVITIES

Week 1 (June 14-June 18, 1993)

Time	Day				
	Monday 14	Tuesday 15	Wednesday 16	Thursday 17	Friday 18
8:00	Welcome and Orientation 104 Stadler	Research	Collaborative T. Kardis 107 Stadler	Research	Research
8:30	Pre-Testing Session 107 Stadler		Communication Dr. Martin 232 Benton		
10:00	Library Tony Kardis		ID Photos, Woods		
10:30	Computer Lab with Tony Kardis and Linda D'Avignon		Science Seminar Series: "Ecocardiography..." Dr. J. Miller 232 Benton		
11:30			Mentor & Staff Meeting (No Students) 227 Research		
12:00	Lunch Provided with Prof. Griesedieck Intro. to Phil. of Sci. Hawthorn Room	Lunch	Lunch Provided Career Confab Prof. L. Barton Hawthorn Room	Lunch	Lunch
1:00	Science Seminar Series: "Is Science Value Free?" Dr. Z. Tang-Martinez 121 Research	Research	Research	Research	Research
1:30					
2:00	Introduction of Mentor Scientists 121 Research				
2:15	Laboratory Get Acquainted Visits				
2:30	Research				
5:00	Adjournment	Adjournment	Adjournment	Picnic at Shaw Park	Adjournment
8:00				Adjournment	

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THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
SCHOLAR RESEARCH PROGRAM

"EXPERIENCING THE SCIENTIFIC ENTERPRISE"

1993
SCHEDULE OF ACTIVITIES

Week 2 (June 21-June 25, 1993)

Time	Day				
	Monday 21	Tuesday 22	Wednesday 23	Thursday 24	Friday 25
8:00	Collaborative T. Kardis 107 Stadler	Research	VISITATION DAY Collaborative T. Kardis 107 Stadler	Research	Research
9:00	Communication Dr. Martin 232 Benton		Communication Dr. Martin 232 Benton		
10:30	Science Seminar Series: "Argument Games" Prof. R. Loui 232 Benton		Break		
11:00			Science Seminar Series: "NMR and Its Application" Prof. C. Armbruster 232 Benton		
11:30	Mentor & Staff Meeting 227 Research (No Students)				
12:00	Lunch Provided Career Confab Prof. S. Bissen Hawthorn Room	Lunch	Lunch Provided Career Confab John Fuller, KSDK Hawthorn Room	Lunch	Lunch
1:00	Research	Research	Research	Research	Research
5:00	Adjournment	Adjournment	Adjournment	Adjournment	Adjournment
7:30		Observatory/ Planetarium T. Giblin			
10:00		Adjournment			

THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
SCHOLAR RESEARCH PROGRAM

"EXPERIENCING THE SCIENTIFIC ENTERPRISE"

1993

SCHEDULE OF ACTIVITIES

Week 3 (June 28-July 2, 1993)

Time	Day				
	Monday 28	Tuesday 29	Wednesday 30	Thursday 1	Friday 2
8:00	Collaborative T. Kardis 107 Stadler	Research	Collaborative T. Kardis 107 Stadler	Research	Commencement Rehearsal During Collaborative T. Kardis 104 Stadler
9:00	Communication Dr. Martin 232 Benton		Communication Dr. Martin 232 Benton		Communication Dr. Martin 232 Benton
10:30	Science Seminar Series: "Was Einstein Right?" Dr. C. Will 232 Benton		Science Seminar Series: "Vision and 3-D" Prof. S. Lehmkuhle 104 CCB (Mac Lab)		Science Seminar Series: $i = e^{\frac{-pi}{2}}$ Dr. W. Connett 232 Benton
11:30	Mentor & Staff Meeting (No Students) 227 Research				
12:00	Lunch Provided with Prof. J. Leventhal Hawthorn Room	Lunch	Lunch	Lunch	Lunch Provided Career Confab Hawthorn Room
1:00	Research	Research	Research	Research	Research
4:00	Bus Leaves for Union Station Bring Money for Dinner				
5:00		Adjournment	Adjournment	Adjournment	Adjournment
7:30	Baseball Night Cards vs. Phillies				
10:30	Adjournment				

THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
SCHOLAR RESEARCH PROGRAM

"EXPERIENCING THE SCIENTIFIC ENTERPRISE"

1993

SCHEDULE OF ACTIVITIES

Week 4 (July 5-July 9, 1993)

Time	Day				
	Monday 5	Tuesday 6	Wednesday 7	Thursday 8	Friday 9
8:00		Research	Collaborative T. Kardis 107 Stadler	Research	Engelmann I Project Presentations 120 & 121 Research
8:30			Communication Dr. Martin 232 Benton		
10:00			Bus Leaves for Washington Univ.		
10:30			Science Seminar Series: "Plate Tectonics and the Structure..." Dr. M. Wysession 361 McDonnell Hall		
12:00		Lunch	Lunch provided at Washington University	Lunch	Lunch Provided Hawthorn Room
1:00	**Independence Day Break**	Research	Lab Rounds Washington University	Research	Engelmann I Project Presentations 120 & 121 Research
2:30					Engelmann I Scholar Confirmation Ceremony 104 Stadler
2:45					Commencement Presentation and Reception 104 Stadler
5:00		Faculty Challenge Students & Softball	Adjournment	Adjournment	Adjournment
6:00		Pool & Pizza Party UMSL Honors College			
9:00		Adjournment			

THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
SCHOLAR RESEARCH PROGRAM

"EXPERIENCING THE SCIENTIFIC ENTERPRISE"

1993
SCHEDULE OF ACTIVITIES

Week 5 (July 12-July 16, 1993)

Time	Day				
	Monday 12	Tuesday 13	Wednesday 14	Thursday 15	Friday 16
8:00	Collaborative T. Kardis 107 Stadler	Research [Optional: 8-10 a.m. Dr. T. Martin will be available for consultation about research paper in 227 Research.]	Collaborative T. Kardis 107 Stadler	Lab Rounds UM-St. Louis	Research
8:30	Communication Dr. Martin 232 Benton				
9:00			Communication Dr. Martin 232 Benton		
10:00	Bus Leaves for St. Louis University				
10:30	Science Seminar Series: at St. Louis University "Problem Solving Through Molecular Biology" Dr. Cliff Bellone Lecture Hall D		Science Seminar Series: "New Products Using Receptor Ligand Interaction" Dr. E. Fox 232 Benton		
11:30			Mentor & Staff Meeting (No Students) 227 Research		
12:00	Lunch Provided at SLU	Lunch	Lunch Provided Career Confab Dr. J. Lee Cypress Room	Lunch	Lunch
1:00	Lab Rounds St. Louis University	Research	Research [Optional: 3-5 p.m. Dr. T. Martin will be available for consultation about research paper in 227 Research.]	Research	Research
5:00	Adjournment	Adjournment	Adjournment	Adjournment	
6:30					Overnight at St. Louis Science Center
10:30					Adjournment 10:30 a.m. Sat. 7/17

THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
SCHOLAR RESEARCH PROGRAM

"EXPERIENCING THE SCIENTIFIC ENTERPRISE"

1993

SCHEDULE OF ACTIVITIES

Week 6 (July 19-July 23, 1993)

Time	Day				
	Monday 19	Tuesday 20	Wednesday 21	Thursday 22	Friday 23
8:00	Collaborative T. Kardis 107 Stadler	Research	Collaborative T. Kardis 107 Stadler	Research	Collaborative T. Kardis 107 Stadler
9:00	Communication Dr. Martin 232 Benton		Communication Dr. Martin 232 Benton		Post-Testing Session 121 Research
10:30	Science Seminar Series "Evolutionary Ecology..." Prof. R. Marquis 232 Benton		Lab Rounds UM-St. Louis		
11:00					Paper Presentations 121 Research
12:00	Lunch Provided Career Confab J. McGarry Hawthorn Room	Lunch	Lunch	Lunch	Lunch Provided Hawthorn Room
1:00	Research [Optional 1-3 p.m. Dr. T. Martin available for consultation about research paper in 227 Research.]	Research	Research	Research	Paper Presentations 121 Research
2:15					Break
2:30					Paper Presentations 121 Research
4:00					Awards Ceremony and Reception 104 Stadler
5:00	Adjournment	A Night at the Movies Jurasic Park Don't See the Movie! Read the Book First!	Adjournment	Adjournment	

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THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
Scholar Research Program

Definition of Activities

Welcome: Appropriate staff welcome students to summer program.

Orientation: Definition and outline of summer science program.

Assessment Session: Pre- and Post-testing to determine significant gain in subject matter information and attitude change.

Laboratory Get Acquainted Visits: The initial introduction and orientation of the student with the members and facilities of the research laboratory in which they will do their summer project.

Science Seminar Series: A string of 12 one hour presentations by research faculty in their area of expertise. Presentations are open to the University community. Participants will be assigned readings prior to the seminar.

Collaborative: A meeting of all participants and the directors scheduled as the first activity each day. It is an opportunity for participants to share their experiences and concerns. Extra help will be provided for student research projects, paper writing assignments, library skills, and any other activities that are part of the program.

Lunch Cypress Room: Lunch together with all participants.

Lunch Hawthorn Room: Lunch together with Science Scholar participants.

Lunch: Lunch on your own or with research lab personnel.

Research: Work with mentor scientist on research project.

Communication Course: A formal course with no credit that includes an introduction to research documentation, development of writing skills for abstracts, summaries, technical definition, analysis, technical reports, and proposals. Skills for oral presentation of research papers are discussed and practiced.

Mentor & Staff Meeting: Weekly meeting of mentor scientists, directors, and program staff to discuss progress of students and to formatively evaluate the program.

Career Confab: A lunch time meeting during which career possibilities in various science related fields are presented and discussed by members of the corporate scientific community.

Lab Rounds: Students will visit the research setting of other students, meet the laboratory workers and mentor scientists, and discuss ongoing research and career opportunities.

Paper Presentation: Culminating activity during which students orally present their research paper. Presentations are ten minutes in length with two minutes for questions.

Awards Ceremony: Awarding of the recognition as National Science Foundation Young Scholars. Students, faculty, and parents will be invited to participate.

APPENDIX B

1992-93 ENGELMANN ACADEMIC YEAR PROGRAM

SESSION 7
ANTHROPOLOGY: WHOOO ARE YOU?!

Join us for the seventh session of the 1992-93 Academic Year Program for an informative evening discussing anthropology and Africa. Please invite your parents, teachers and guidance counselor to join you.

Dr. Jean Ensminger, Professor of Anthropology, Washington University, will discuss the role of a cultural anthropologist and careers relating to anthropology. We will look at our development and the economic development of Africa.

Sponsored by:
A.P. and J.B. Green Foundation • National Science Foundation • James S. McDonnell Foundation
American Honda Foundation • Monsanto Company • McDonnell Douglas Corporation
Emerson Electric Company • Elberth R. and Gladys Flora Grant Charitable Trust
St. Louis County Water Company • GTE Telephone Operations • American Institute of Chemical Engineers
Worldwide Insurance Group • Medicine Shoppe International • St. Louis University • Washington University
University of Missouri-St. Louis

DATE: MONDAY, APRIL 26, 1993
TIME: 7:00 - 9:30 P.M.
PLACE: 78 J.C. PENNEY BUILDING
RECEPTION: HAWTHORN ROOM, UM-ST. LOUIS

We look forward to seeing you! We encourage 1988-92 Engelmann Scholars, friends, faculty, and parents to attend. Parking for the J.C. Penney Building is on the East Drive, Lots C & D. If you have any questions, call 553-6522.

PLEASE RETURN THE FORM BELOW BY APRIL 16, 1993

- ☐ I WILL ATTEND THE ACADEMIC YEAR PROGRAM
- ☐ I WILL NOT ATTEND
- ☐ I NEED A RIDE
- ☐ I WILL BE WILLING TO PROVIDE A RIDE

NAME _____

SUMMER ATTENDED ENGELMANN INSTITUTE 19 _____ YEAR IN SCHOOL _____

SCHOOL OR INSTITUTION _____

INTENDED MAJOR _____

NAME(S) OF GUEST(S) _____

SCHOOL GUEST(S) ATTEND(S) _____

PLEASE NOTIFY US OF ANY CHANGE OF ADDRESS

ANNOUNCING THE 1992-93 ENGELMANN ACADEMIC YEAR PROGRAM!!

TUESDAY, SEPTEMBER 29, 1992 - 6:30-9:30 p.m.

"Engineering Technology in the Automotive Industry"
Chrysler Corporation Assembly Plant Tour

MONDAY, OCTOBER 19, 1992; 7:00 - 9:30

"The Move to College Applications, Admissions, and Finances"

Ms. Rochelle DeClue, Assistant Director of Admissions
Mr. Hal Deuser, Director of Financial Aid, St. Louis University
Dr. Frederick Fausz, Dean, Honors College, University of Missouri-St. Louis
Dr. Harold Wingood, Dean, Undergraduate Admissions, Washington University

TUESDAY, NOVEMBER 24, 1992; 7:00 - 9:30 p.m.

"Engelmann Scholar Research: Where to Go Next?"

Dr. James Carrell, State Director, Westinghouse Talent Search
Dr. Melba James, Director, St. Louis Science Fair
Dr. Patricia Thro, Director, Missouri Junior Academy of Science
Mr. Scott Smith, Administrator, National Science Scholarship Program
Dr. Charles Granger, Director, Junior Science, Engineering and Humanities Symposium

Also, **Science Bowl: "The Challenge of the Minds!"**

TUESDAY, JANUARY 5, 1993; 6:00 - 9:30 p.m.

"Prediction and Visualization of Chemical Properties and Reactivity"

Dr. William Welsh, Associate Professor of Chemistry, University of Missouri-St. Louis
Dr. Carl Tenpas, The Techtronix Company

Also, **College Panel and ENGELMANN SCHOLAR REUNION!**

MONDAY, FEBRUARY 8, 1993; 7:00 - 9:30 p.m.

"Allergies and Allergens - Who, What, Where Is the Culprit?"
Dr. Raymond Slavin, Professor of Microbiology, St. Louis University

THURSDAY, FRIDAY, SATURDAY; MARCH 18, 19, 20, 1993; ALL DAY

Junior Science, Engineering and Humanities Symposium, "Two Decades of Science Scholars

MONDAY, APRIL 26, 1993; 7:00 - 9:30 p.m.

"Whooo Are You?"
Dr. Jean Ensminger, Professor of Anthropology, Washington University

SUNDAY, MAY 23, 1993; 4:00 - 6:30 p.m.

Ecological Conservation: Engelmann Forest Babler State Park
Missouri, Department of Conservation
Gayle Todd, Research Forester

Also, **End of Year Picnic!**

ANNOUNCING THE 1993-94 ENGELMANN ACADEMIC YEAR PROGRAM

The tentative schedule for the 1993-94 Academic Year Program is as follows:

WEDNESDAY, SEPTEMBER 22, 1993; 7:00-9:30 p.m.

"The Move to College Applications, Admissions, and Finances"

Ms. Rochelle DeClue, Assistant Director of Admissions, University of Missouri
Mr. Hal Deuser, Director of Financial Aid, St. Louis University
Dr. Frederick Fausz, Dean, Pierre Laclede Honors College, UM-St. Louis
Mr. Kent Hopkins, Director of Undergraduate Admissions, St. Louis University
Ms. Jane Schoenfeld, Associate Dean of Admissions, Washington University

SUNDAY, OCTOBER 31, 1993; 2:30-5:30 p.m.

"St. Louis Science History Stories and a Pilgrimage to Dr. Engelmann's Grave Site"

Mr. Bert Minkin, Story Teller/Historian, the Missouri Arts Council's Artist Residency Program.

SATURDAY, NOVEMBER 13, 1993

"Environmental Science," A Seminar Series presented by Washington University

JANUARY, 1994

"Behavior and Communication," by Dr. Zuleyma Tang-Martinez, Professor of Biology and Alumni Scholar Reunion with Texas Line Dancing.

FEBRUARY, 1994

"A-B Fermentation," A Field Trip to Anheuser-Busch Company.

THURSDAY, FRIDAY, SATURDAY; MARCH 17 18, 19, 1993; ALL DAY

Junior Science, Engineering and Humanities Symposium, "Science: A Universe of Questions"

APRIL, 1994

Cahokia Mounds, An Anthropological study with Dr. Van A. Reidhead, Professor of Anthropology.

MAY, 1994

Engelmann Woods, A Spring Field Trip.

University of Missouri St. Louis

GEORGE ENGELMANN

MATHEMATICS & SCIENCE INSTITUTE

1993
Orientation

Advisory Committee

High School Representatives

Mr. Tom Cradick	Parkway North High School
Mr. Tony Kardis	Ladue Horton Watkins High School
Ms. Karen Tichy	Catholic Education Office
Mr. Tom Yager	John Burroughs School

Corporate and Community Representatives

Mr. Elmer Boehm	Monsanto Corporation (retired)
Mr. Mark Botterman	Emerson Electric Company
Mr. Larry Carp	Carp, Sexauer and Carr Attorneys
Mr. James McGarry, Jr.	McDonnell Douglas Corporation
Dr. Paul Markovits	Math and Science Education Center
Mr. Ken Sowell	St. Louis Science Center
Mr. Ned Siegel	Monsanto Company
Mr. Bruce Smith	Normandy School District
Dr. Seenu Srinivasen	Mallinckrodt Inc.
Dr. Carl Tenpas	CaChe Scientific
Mr. George Tomazi	Mallinckrodt
Mr. George Willson	A.P. & J.B. Green Foundation

University Representatives

Dr. James Bundschuh	St. Louis University
Dr. Bernard Feldman	Department of Physics
Dr. Rick George	Dean, School of Education
Dr. Sandra Gottfried	Departments of Biology and Educational Studies
Dr. James O'Brien	Department of Chemistry
Dr. Wendell Smith	Dean, Continuing Education and Outreach

Englemann Scholar Representatives

Ms. Quiana Cope	Ladue Horton Watkins High School
Mr. Damon Vincent	Washington University

Institute Administration

Dr. Blanche M. Touhill	Chancellor
Dr. E. Terrence Jones	Dean, College of Arts and Sciences
Dr. Rick George	Dean, School of Education
Dr. Charles R. Granger	Director
Dr. Teresa Thiel	Co-Director, Scholar Research Program
Ms. Pamela L. Iverson	Co-Director
Dr. Kenneth R. Mares	Associate Director
Ms. Nancy Diley	Administrative Aide
Ms. Judy Leonard	Interim Coordinator

University of Missouri-St. Louis
George Engelmann Mathematics & Science Institute
Orientation Program

June 13, 1993

Welcome	Dr. Roosevelt Wright Jr. Vice Chancellor for Academic Affairs University of Missouri-St. Louis
Greetings	Dr. Rick George Dean, School of Education University of Missouri-St. Louis
The George Engelmann Institute: Curriculum Overview	Dr. Charles R. Granger Professor Departments of Biology and Educational Studies University of Missouri-St. Louis
Recollections by	George Engelmann, M.D. (1809-1884) with Dr. Steven Rowen Professor of History University of Missouri-St. Louis
Reception	Research Atrium

Sponsors

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St. Louis County Water Company
GTE Telephone Operations
American Institute of Chemical Engineers
Worldwide Insurance Group
Medicine Shoppe
International Inc.
St. Louis University
Washington University
University of Missouri-St. Louis

Mentor Faculty

Mr. Tom Cradick, Parkway North High School
Ms. Kelly Javier, St. John's Prep High School
Mr. Gary Kallansrud, Parkway West High School
Mr. Tony Kardis, Ladue Horton Watkins High School
Ms. Ellen Norris, Christian Brothers College High School

Engelmann Science Scholar Program
Faculty

Dr. Lawrence Barton
Dr. Shirley Bissen
Dr. John Boswell
Dr. Jerry Bryant
Ms. Linda d'Avignon
Dr. Larry DeBuhr
Ms. Linda Duke
Dr. Bernard Feldman
Mr. Chris Flores
Dr. Phil Fraundorf
Dr. Harvey Friedman
Mr. John Fuller
Mr. Wayne Garver
Mr. Tim Giblin
Dr. Charles Granger
Mr. David Griesedieck
Dr. James Hunt
Dr. Jacob Leventhal
Dr. Terry Martin
Ms. Kathi McDonald
Mr. James McGarry, Jr.
Dr. Robert Murray
Mr. Michael Sampson
Dr. Alan Schwartz
Dr. Richard Schwartz
Mr. Ned Siegel
Ms. Denise Silvester
Dr. Teresa Thiel
Dr. Bruce Wilking

Engelmann Scholar Research Program
Faculty

Dr. Robert Aldridge*
Dr. Charles Armbruster
Dr. Richard Axelbaum***
Dr. Lawrence Barton
Dr. Carl Bassi**
Dr. Cliff Belone
Dr. Shirley Bissen
Dr. Robert Bolla*
Dr. John Boswell**
Dr. William Connett**
Ms. Linda d'Avignon
Dr. Dorothy Feir*
Dr. Bernard Feldman**
Dr. Eugene Fox
Dr. Phil Fraundorf**
Mr. John Fuller
Mr. Tim Giblin
Dr. Charles Granger**
Dr. Michael Green*
Dr. David Griesedieck
Dr. Richard Grodsky***
Dr. Harold Harris**
Dr. Wesley Harris**
Dr. Bamin Khomami***
Dr. Robert Kranz***
Dr. Stan Kwasny***
Dr. David Lagunoff*
Dr. Jay Lee
Dr. Stephen Lehmkuhle**
Dr. Jacob Leventhal**
Dr. Ronald Loui***
Dr. Terry Martin
Dr. Robert Marquis
Mr. James McGarry, Jr.
Dr. James Miller
Dr. James O'Brien**
Dr. Miles Patterson**
Dr. Nigam Rath**
Dr. William Richard***
Dr. James Riehl**
Dr. David Russell**
Dr. Alan Schwartz**
Dr. Michael Sesma**
Dr. Donald Snyder***
Dr. John Stern***
Dr. Zuleyma Tang-Martinez
Dr. George Taylor**
Dr. Teresa Thiel**
Dr. Vetta Sanders Thompson**
Dr. Clifford Will
Dr. Michael Wysession

Research Mentors

*St. Louis University **University of Missouri-St. Louis ***Washington University

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GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
University of Missouri-St. Louis

The Engelmann Scholar Research Program
"Experiencing the Scientific Enterprise"
June 14 - July 23, 1993

Sponsored by

The National Science Foundation
Young Scholars Program
St. Louis University
Washington University
University of Missouri-St. Louis

I. Young Scholar Participant Information

Name:_____

Address:_____

School Attending:_____

Telephone Number: Home_____ School_____

II. Research Interest Areas Available for Study
Please look at entire list of selections and rank your top six choices. (1=high - 6=low)

A. BIOLOGY

1.___ Dr. Robert Aldridge: Animal Behavior - Reproductive Biology of the Brown Tree Snake.
2.___ Dr. Robert Bolla: Plant Parasitic Nematode - Plant Interactions, Chemistry and Molecular Biology of the Resistance Response. Nematode Genetics.
3.___ Dr. Dorothy Feir: Entomology: Study of Ticks and Spirochetes That Cause Lyme Disease.
4.___ Dr. Charles Granger: Determining Correlates to Successful Studies in Science.
5.___ Dr. Michael Green: Application of Recombinant DNA Technology to Studies of Membrane Biosynthesis and Mammalian Stress Response.
6.___ Dr. Robert Kranz: Molecular Biology and Bacterial Genetics - Biosynthesis of Biodegradable Polymers by Photosynthetic Bacteria.
7.___ Dr. David Lagunoff: Effects of Mast Cell Granules on Endothelial Cells.
8.___ Dr. Victoria Sork: Plant Ecology - Experimental Study of Oak Seedlings.
9.___ Dr. Teresa Thiel: Molecular Biology of Nitrogen Fixation in Cyanobacteria.
10.___ Dr. Lon Wilkens: Neurophysiology - Neuromodulation of Sensory Function in Crayfish.
11.___ Dr. William S. Wold: Molecular Pathogenesis of Human Adenovirus Infections.

B. CHEMISTRY

12.___ Dr. Richard Axelbaum: Combustion Research; Gas-Phase Synthesis of Ultrafine Particles.
13.___ Dr. Bamin Khomami: Computational Fluid Dynamics - Viscoelastic Flows and Fluids.
14.___ Dr. Harold Harris: Electric Field Perturbation of Hydrocarbon Flames.

15.___ Dr. Wesley Harris: Bioinorganic Chemistry - The Function of Behavior of Metal Ions in Biological Systems. Biochemistry of Iron.
16.___ Dr. Jim O'Brien: Spectroscopy Using Intracavity Laser Techniques for Planetary Atmospheres Research.
17.___ Dr. James P. Riehl: Polarized Luminescence as a Probe of Molecular Structure.
18.___ Dr. Nigam Rath: Determination of 3-D Structure and Absolute Configuration of Molecules.

C. MATHEMATICS AND COMPUTER SCIENCES

19.___ Dr. William Connett: Symbolic Calculations and Orthoginal Polynomials.
20.___ Dr. Richard Grodsky: Identification of a Set of Subskills to be Used in a Syllabus on Fractional Arithmetic Which Will Support the Development of an Intelligent Tutoring System.
21.___ Dr. Stan Kwasny: Experimenting with Neural Networks.
22.___ Dr. Ronald Loui: Artificial Intelligence - Logic, Debate, Formal Rules of Logical Argument.
23.___ Dr. W.D. Richard: Computer Engineering - Ultrasonic Imaging/Instrumentation.
24.___ Dr. Alan Schwartz: Using the Computer Algebra System - Maple - to Explore Mathematical Problems.

D. OPTOMETRY

25.___ Dr. Carl Bassi: Visual Evoked Potentials.
26.___ Dr. Stephen Lehmkuhle: Neurophysiology - Neural Bases of Vision.
27.___ Dr. Michael A. Sesma: Organization of the Extrastriate Visual Cortex and the Toxic Effects of Excitatory Amino Acids on Visual System Neurons.

E. PHYSICS AND EARTH SCIENCES

28.___ Dr. Bernard Feldman: Growth and Characterization of Amorphous and Crystalline Semiconductors and Insulators.
29.___ Dr. Phil Fraundorf: The Study of Materials and Surfaces on Size Scale Between Atoms and Microns.
30.___ Dr. Jacob J. Leventhal: Laser Physics - The Study of Laser-Irradiated Atoms and Their Properties.
31.___ Dr. G.V. Rao: Tropical Meteorology and Meteorological Satellite Applications.
32.___ Dr. Donald Snyder: Computational Imaging Using Engineering and Physics.

F. PSYCHOLOGY

33.___ Dr. John Boswell: Cognitive Maps - Distance Judgement in a Large Scale Environment.
34.___ Dr. Miles Patterson: Impression Formation - The Role of Non-Verbal Cues and Cognitive Demand.
35.___ Dr. John A. Stern: Eye Movements and Blinking - Reflectors of Information Processing.
36.___ Dr. George Taylor: Behavioral Pharmacology and Endocrinology Research with Rats as Animal Models of Human Brain Function.

Please return this preference list with the Application by March 30, 1993 possible to:

Dr. Charles R. Granger
University of Missouri-St. Louis
Department of Biology
8001 Natural Bridge Road
239 Research Wing
St. Louis, MO 63121-4499
Telephone: 553-6226

OR

Dr. Teresa Thiel
University of Missouri-St. Louis
Department of Biology
8001 Natural Bridge Road
440 Research Wing
St. Louis, MO 63121-4499
Telephone: 553-6200

1993 ENGELMANN INSTITUTE SCHOLAR RESEARCH PROGRAM

"Science Seminar Series"

Date	Time	Presenter	Topic	Room
6/14	1:00pm	Dr. Zulema Tang-Martinez	"Is Science Value Free?"	121R UMSL
6/16	10:00am	Dr. James Miller	"Ecocardiography and the Cardiovascular System"	121R UMSL
6/21	10:00am	Dr. Ronald Loui	"Argument Games"	121R UMSL
6/23	11:00am	Dr. Charles Armbruster	"NMR and Its Application"	121R UMSL
6/28	10:30am	Dr. Clifford Will	"Einstein's Theory"	121R UMSL
6/30	10:30am	Dr. Stephen Lehmkuhle	"Vision and 3-D"	104CCB UMSL
7/2	10:30am	Dr. William Connett	"$i = e^{\frac{-Pi}{2}}$"	121R UMSL
7/7	10:30am	Dr. Michael Wysession	"Plate Tectonics and the Structure of the Interior of the Earth" [Followed by tour of McD.H. and lunch with Dr. Macias. Lab rounds begin 1:15pm]	McD.H WU
7/12	10:30am	Dr. Cliff Bellone	"Problem Solving Through Molecular Biology"	Lecture Hall D 4th Floor School of Med. SLU
		[Followed by tour of Medical School labs and lunch with Dr. Lagunoff in 103 LRC. Leave 1:15 pm for lab rounds at Frost Campus]		
7/14	10:30am	Dr. Eugene Fox	"New Medical Products Using Receptor Ligin Interaction"	121R UMSL
7/19	10:30am	Dr. Robert Marquis	"Evolutionary Ecology of Tropical Plants"	121R UMSL

George Engelmann Mathematics & Science Institute
Scholar Research Program

Scientific & Technical Writing

Dr. T. Martin
Summer 1993

Lucas Hall 427
553-5619

OBJECTIVES

Two important beliefs will guide much of our activity in class: that the scientific paper is the culmination of scientific research (Robert Day, 1983) and that the best language is that which gives meaning in the fewest, short words (BioScience, 9-86).

Writing in the sciences must be effective because no work or experiment, however brilliant, can contribute to the existing fund of scientific knowledge unless it has been clearly and accurately described to others. Most scientists, scientific educators, and your instructor subscribe to the concept expressed in the previous statement.

Therefore, this course is designed to help you learn the basic elements of **effective writing in the sciences and technology.** To achieve these aims, we will cover such matters as the following:

- distinguishing scientific and technical writing from writing in English classes;
- developing a concise, readable style;
- understanding organizational patterns such as the IMRAD structure;
- preparing abstracts, procedures, instructions, and objective descriptions;
- integrating graphics and text;
- using appropriate, research methods and documentation;
- practicing the same degree of care in scientific writing as in other scientific activities.

TENTATIVE SYLLABUS

Date		Activity
		First Week
Wed.	6/16/93	Orientation Objectives and Outline Syllabus (handout) Attitudes to Writing Diagnostic Assignment
		Second Week
Mon.	6/21	Writing: Myths & Misconceptions Introduction to Scientific & Technical Writing Gathering & Researching Information Record Keeping
Wed.	6/23	Summarizing and Abstracting Information Memos and Short Reports
		Third Week
Mon.	6/28	Technical Description Evaluation of Progress Reports Revising for a Readable Style
Wed.	6/30	Clarity and Conciseness
Fri.	7/2	Fluency and Exactness
		Fourth Week
Wed.	7/7	Tone and Style Outlining and Organizing Shaping Paragraphs
		Fifth Week
Mon.	7/12	Creating Useful Definitions Use of Visual Aids Creating Visual Aids
Wed.	7/14	Drafting and Revising
		Sixth Week
Mon.	7/19	Procedures and Processes Preparing Instructions Evaluation of Progress Reports
Wed.	7/21	Research Documentation Methods Draft Abstracts Evaluated

George Engelmann Mathematics and Science Institute

Science Research Program

Confab Presenters and Career Topics

Confab Presenters	Career Areas
James McGarry McDonnell Douglas Corporation	Aeronautical Engineering
John Fuller KSDK-TV	Atmospheric Science
Teresa Thiel Department of Biology UM-St. Louis	Biology
Ashlee Cribb Monsanto Company	Chemical Engineering
Lawrence Barton, Chairperson Department of Chemistry UM-St. Louis	Chemistry
Jacob Leventhal Curators Professor Department of Physics UM-St. Louis	Physics
Ella Swierkosz St. Louis University	Virology

The George Engelmann Mathematics and Science Institute
Scholar Research Program
SCHOLAR RESEARCH PAPERS

Friday, July 23, 1993 | **Mr. Tony Kardis, Advisor** | **120 and 121 Research Complex**

Craig Carmen, Parkway North High, "Absorption of Human Serum Albumin on Substrates Common in Artificial Heart Valves," Dr. Bernard Feldman, University of Missouri-St. Louis

Sarah Crank, McCluer High, "The Effects of Modality and Cognitive Demand on Person Perception," Dr. Miles Patterson, University of Missouri-St. Louis

William DeLong, Northwest House Springs High, "Studying Correlates to Science Achievement," Dr. Charles R. Granger, University of Missouri-St. Louis

Brian Demsky, Lafayette High, "Detection of Metastable Barium Atoms," Dr. Jacob Leventhal, University of Missouri-St. Louis

Philana Harris, Eskridge High, "Eye Movements During Blinks - Changes as a Function of Time on Task," Dr. John A. Stern, Washington University

Kevin Heisinger, Northwest House Springs High, "Studying Patterns in Orthogonal Polynomials with the Use of Maple," Dr. William Connett, University of Missouri-St. Louis

Christopher Hodits, Francis Howell High, "Neurophysiology and Respiration in Lampreys," Dr. David Russell, University of Missouri-St. Louis

Leo Hsu, Parkway North High, "Distribution of ERp72 and ERp61 in Mice Tissue," Dr. Michael Green, St. Louis University

Esther Kim, Webster Groves High, "Behavioral Neurochemistry of Brain Asymmetry: Influence of Dopamine Antagonism with Administration of Haloperidol and Sulpiride to Female Rats," Dr. George Taylor, University of Missouri-St. Louis

Patricia Land, Pattonville High, "The Effects of Mast Cell Granules on Bovine Endothelial Cells," Dr. David Lagunoff, St. Louis University

Bridgette Lovings, Eskridge High, "African American Women's Perception and Atitude Towards Breast Cancer and Mammography," Dr. Vetta Sanders Thompson, University of Missouri-St. Louis

Rostislav Lukatsevich, Parkway North High, "The Signalling of the Malfolded Envelope Precursor Polyprotein gPr80^{env} in the Endoplasmic Reticulum of Mammalian Cells: A Study of Molecular Biology," Dr. Michael Green, St. Louis University

Jessica Mitchell, Hazelwood East High, "The Stimulation of the Mating Behavior in the Northern Watersnake *Nerodia sipedon*," Dr. Robert Aldridge, St. Louis University

Khaleah Myers, Parkway West High, "Non-Isothermal Crystallization Kinetics of Polypropylene, High-Density Polyethylene, and Low-Density Polyethylene," Dr. Bamin Khomami, Washington University

Jennifer Ochs, Cor Jesu Academy, "Behavioral Neurochemistry of Brain Assymetry: Influence of Dopamine and Serotonin Antagonism with Administration of Clozapine to Female Rats," Dr. George Taylor, University of Missouri-St. Louis

Judith Pairs, Parkway West High, "Distance and Spatial Estimates Using Cognitive Maps," Dr. John Boswell, University of Missouri-St. Louis

Sharvari Parghi, Parkway South High, "The Effects of Monosodium Glutamate on the Cell Sizes in Various Layers of the Lateral Geniculate Nucleus," Dr. Michael Sesma, University of Missouri-St. Louis

Christopher Perrey, Francis Howell North High, "Gas-Phase Synthesis of TiB_2 in an Open-Air Premixed Hydrogen Flame," Dr. Richard Axelbaum, Washington University

Ian Pervil, Ladue Horton Watkins High, "Using Maple to Look for Trends Involving Orthogonal Polynomials," Dr. Alan Schwartz, University of Missouri-St. Louis

Aman Sabharwal, Mehlville High, "Applications of Neural Networks to Decision Making on Cranial CT Data," Dr. Stan Kwasny, Washington University

David Saff, Fort Zumwalt South High, "The Development of an Intelligent Argumentation System," Dr. Ronald Loui, Washington University

Amy Schmidt, St. Charles High, "The Molecular Biology of Nitrogen Fixation in Cyanobacteria: The Creation of New Antibiotic Resistant Strains," Dr. Teresa Thiel, University of Missouri-St. Louis

John Sebben, St. Louis Priory, "The Development of an Intelligent Tutoring System to Teach Fractional Arithmetic," Dr. Richard Grodsky, Washington University

Michelle Shaw, Rosary High, "The Activity of Phenylanine Ammonia-Lyase in Soybean Resistance to the Soybean Cyst Nematode," Dr. Robert Bolla, St. Louis University

Rebecca Skomal, Fort Zumwalt South High, "Construction of phbA: lacZ Fusion to Study the Regulation of phbA," Dr. Robert Kranz, Washington University

Timothy Stiles, Hillsboro High, "Spectroscopy Using Intracavity Laser Techniques for Planetary Atmospheres Research," Dr. James O'Brien, University of Missouri-St. Louis

Ryan Taylor, Hazelwood West High, "Single Crystal X-ray Structure Determination," Dr. Nigam Rath, University of Missouri-St. Louis

Tammy Teague, Herculaneum High, "Saccadic Eye Movements - The Determination of the Express Saccade." Dr. Steven Lehmkuhle, University of Missouri-St. Louis

Jennifer Teece, Francis Howell North High, "The Effect of Adenovirus Region E3-14.7K Protein on the Induction of Cellular Genes by Tumor Necrosis Factor," Dr. William Wold, St. Louis University

Raina Thomas, Ladue Horton Watkins High, "The Phenomenon of Liesegang Rings," Dr. Harold Harris, University of Missouri-St. Louis

Jennifer Tucker, Francis Howell High, "The Effects of Tip Geometry on Scanning Tunneling Microscope Images," Dr. Phil Fraundorf, University of Missouri-St. Louis

Amy Vavere, Pattonville High, "Determination of the Effects of Sodium Chloride on the Binding of Pyrophosphate to Human Serum Apotransferrin," Dr. Wes Harris, University of Missouri-St. Louis

Isey White, Rosati-Kain High, "A Complement to Protein Structure Determination Through Computers," Dr. Donald Snyder, Washington University

Katie Wiechens, Rosati-Kain High, "The Effects of Osmotic Pressure on the Growth of *Borrelia burgdorferi*," Dr. Dorothy Feir, St. Louis University

Jennifer Wu, John Burroughs School, "Development of a PC-Based Ultrasound Image-Processing Software Package for Use in Neurosurgery," Dr. W.D. Richard, Washington University

Susie Wu, Parkway North High, "Computer Molecular Modeling of Europium Triethylenetetraminehexaacetic Acid: A Study of MRI Imaging Agents," Dr. James Riehl, University of Missouri-St. Louis

Karl Young, Lutheran High, "Visual Evoked Potentials: Is the Whole Less Than the Sum of Its Parts?," Dr. Carl Bassi, University of Missouri-St. Louis

GEORGE ENGELMANN

MATHEMATICS & SCIENCE

INSTITUTE

Partnership of Universities Scholar Research Program

1993
National Science Foundation
Young Scholar Confirmation Ceremony

George Engelmann Mathematics & Science Institute
Scholar Research Program

The 1993 National Science Foundation
Young Scholars

Craig Carmen
Parkway North
Sarah Crank
McCluer
William DeLong
Northwest
Brian Demsky
Lafayette
Philana Harris
Eskridge
Kevin Heisinger
Northwest
Christopher Hodits
Francis Howell
Leo Hsu
Parkway North
Soo (Esther) Hyun Kim
Webster Groves
Patricia Land
Pattonville
Bridgette Lovings
Eskridge
Rostislav Lukatsevich
Parkway North
Jessica Mitchell
Hazelwood East
Khaleah Myers
Parkway West
Jennifer Ochs
Cor Jesu Academy
Judith Pairs
Parkway West
Sharvari Pharghi
Parkway South
Christopher Perrey
Francis Howell North
Ian Pervil
Ladue Horton Watkins
Aman Sabharwal
Mehlville
David Saff
Fort Zumwalt South
Amy Schmidt
St. Charles
John Sebben
St. Louis Priory
Michelle Shaw
Rosary
Rebecca Skomal
Fort Zumwalt South
Timothy Stiles
Hillsboro
Ryan Taylor
Hazelwood West
Tammy Teague
Herculaneum
Jennifer Teece
Francis Howell North
Raina Thomas
Ladue Horton Watkins
Jennifer Tucker
Francis Howell
Amy Vavere
Pattonville
Isey White
Rosati-Kain
Adrianne (Katie) Wiechens
Rosati-Kain
Jennifer Wu
John Burroughs
Susie Wu
Parkway North
Karl Young
Lutheran West

George Engelmann Mathematics & Science Institute
Scholar Research Program
Scholar Confirmation Ceremony

July 23, 1993

Procession	National Science Foundation Young Scholar Candidates
Presider	Dr. Teresa Thiel Associate Professor of Biology University of Missouri-St. Louis
Welcome	Dr. Donald H. Driemeier Deputy to the Chancellor University of Missouri-St. Louis
Greeting	Dr. William L. Marsden Associate Dean, School of Engineering and Applied Science Washington University
Introduction of Challenge Address	Dr. Charles R. Granger Professor of Biology and Education University of Missouri-St. Louis
Challenge Address	Dr. Joseph E. Wall Vice President for Technology Emerson Electric Company
Awarding of Certificates	Engelmann Faculty
Summer Program Review	National Science Foundation Young Scholars
Reflections	Craig Gilbert Engelmann Scholar '89 National Science Foundation Young Scholar '90 Junior, Washington University
Engelmannia II	Research Scholars
Reception	Research Atrium

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George Engelmann Mathematics & Science Institute
Scholar Research Program

The 1993 Faculty and Staff

Robert D. Aldridge, Professor of Biology, St. Louis University
Charles W. Armbruster, Associate Professor of Chemistry
Richard L. Axelbaum, Assistant Professor of Mechanical Engineering, Washington University
Carl J. Bassi, Assistant Professor of Optometry
Clifford J. Bellone, Professor of Microbiology, St. Louis University
Shirley T. Bissen, Assistant Professor of Biology
Robert I. Bolla, Professor of Biology and Chairperson, St. Louis University
John J. Boswell, Assistant Professor of Psychology
Jerry L. Bryant, Assistant Professor of Biology
William C. Conner, Professor of Mathematics and Computer Science
Ashlee Cribb, Chairperson, St. Louis Section A.I.Ch.E.
Ms. Linda d'Avignon, Librarian II, Thomas Jefferson Library
William DeLong, Senior Assistant, Northwest High School
Nancy K. Diley, Administrative Aide, Departments of Biology and Continuing Education
Susan Farr, Research Assistant, Department of Psychology
Dorothy J. Feir, Professor of Biology, St. Louis University
Bernard J. Feldman, Professor of Physics and Chairperson
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Philip Fraundorf, Associate Professor of Physics
John Fuller, Meteorologist, KSDK
Tim Giblin, Research Assistant, Department of Physics
Craig Gilbert, 1990 NSF Young Scholar, Washington University
Charles R. Granger, Professor of Biology and Education
Michael Green, Professor of Microbiology, St. Louis University
David Griesedieck, Senior Lecturer, Department of Philosophy
Richard Grodsky, Assistant Professor of Electrical Engineering, Washington University
Harold H. Harris, Associate Professor of Chemistry
Wesley R. Harris, Associate Professor of Chemistry
John Judd, Research Associate, Department of Biology
Anthony Kardis, Advisor, Engelmann Institute
Bamin Khomami, Associate Professor of Chemical Engineering, Washington University
Robert G. Kranz, Assistant Professor of Biology, Washington University
Stan C. Kwasny, Associate Professor of Computer Science, Washington University
David Lagunoff, Professor of Pathology and Chairperson, St. Louis University
Stephen W. Lehmkuhle, Associate Professor of Optometry
Judith Leonard, Co-Director, Engelmann Institute
Jacob J. Leventhal, Curators Professor of Physics
Ronald P. Loui, Assistant Professor of Computer Science, Washington University
Kenneth R. Mares, Associate Director Engelmann Institute
Bud Marsden, Associate Dean, School of Engineering and Applied Sciences, Washington University
Terence S. Martin, Senior Lecturer, Department of English
Robert Marquis, Assistant Professor of Biology
Lynne McCarthy, Senior Secretary, Engelmann Institute
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James G. Miller, Professor of Physics, Washington University
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Miles L. Patterson, Professor of Psychology
Nigam Rath, Research Assistant Professor of Chemistry
William D. Richard, Assistant Professor of Electrical Engineering, Washington University
James P. Riehl, Professor of Chemistry
David F. Russell, Adjunct Assistant Professor of Biology
Dr. Abraham Scaria, Post-Doctoral Fellow, Department of Microbiology, St. Louis University
Alan L. Schwartz, Professor of Mathematics and Computer Science
Michael A. Sesma, Assistant Professor of Optometry
Donald L. Snyder, Samuel C. Sachs Professor of Electrical Engineering, Washington University
Ken A. Sowell, Visitor Services Manager, St. Louis Science Center
John A. Stern, Professor of Psychology, Washington University
Ella Swierkosz, Associate Professor of Pediatrics, St. Louis University
Zuleyma Tang-Martinez, Associate Professor of Biology
George T. Taylor, Professor of Psychology
Teresa Thiel, Associate Professor of Biology
Vetta L. Sanders Thompson, Assistant Professor of Psychology
Clifford M. Will, Professor of Physics, Washington University
William S. Wold, Professor of Microbiology and Chairperson, St. Louis University
Sharon Womack, Graduate Teaching Assistant, Department of Psychology
Michael Wysession, Assistant Professor of Earth and Planetary Science, Washington University

Η ΕΠΙΣΤΗΜΗ ΦΩΤΙΖΕΙ ΤΗΝ ΟΔΟΝ ΤΩΝ ΣΟΦΩΝ.

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The George Engelmann Mathematics and Science Institute
Partnership of Universities

Hereby Commends

for being selected and successfully participating in the George Engelmann Mathematics and Science Institute Scholar Research Program and awards the distinction of

National Science Foundation Young Scholar

on this 23rd day of July, 1993 in St. Louis, Missouri

Charles R. Granger, Ph.D.	Teresa Thiel	Anthony F. Kardis
Director	Co-Director	Advisor
George Engelmann Institute	George Engelmann Institute	George Engelmann Institute

GEORGE ENGELMANN
MATHEMATICS & SCIENCE
INSTITUTE

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THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE
SCHOLARS RESEARCH PROGRAM
PROGRAM EVALUATION
1993

Name: _____

Research Mentor: _____

Directions: We would like to obtain your views about various aspects of the Engelmann Institute. It will help refine the program as we head into future years and a new group of scholars. Please be candid. Rank and evaluate each of the following activities 1 through 12 with one being very important. Your comments are critical to our understanding of your evaluation. Please write your feelings as much as possible in the comment space provided.

	RANK OF ORDER OF IMPORTANCE (1 - 12)	ACTIVITY	EVALUATION LOW 1	2	AVG. 3	4	HIGH 5
1.	_____	Library and Computer Lab Comments: _____	1	2	3	4	5
2.	_____	Communication (T. Martin) Comments: _____	1	2	3	4	5
3.	_____	Lab Rounds Comments: _____	1	2	3	4	5
4.	_____	Individual Research Projects In Laboratory of Mentor Comments: _____	1	2	3	4	5
5.	_____	Written Research Paper (Mr. Kardis) Comments: _____	1	2	3	4	5
6.	_____	Oral Presentation Practice (Mr. Kardis) Comments: _____	1	2	3	4	5
7.	_____	Collaborative (Mr. Kardis) Comments: _____	1	2	3	4	5
8.	_____	Career Confab (Overall) L. Barton (Chemistry) J. Leventhal (Physics)	1 1 1	2 2 2	3 3 3	4 4 4	5 5 5

RANK OF ORDER OF IMPORTANCE (1 - 12)		ACTIVITY	EVALUATION LOW 1	2	AVG. 3	4	HIGH 5
8. Continued		J. Fuller (KSDK)	1	2	3	4	5
		S. Lehmkuhle (Optometry)	1	2	3	4	5
		J. McGarry (McDonnell Douglas)	1	2	3	4	5
		S. Bissen (Biology)	1	2	3	4	5
		E. Swierkosz (SLU)	1	2	3	4	5
		Comments: _____					
9.	_____	Science Seminar Series (Overall)	1	2	3	4	5
		Dr. Tang Martinez (Sci. Value Free?)	1	2	3	4	5
		Dr. Miller (Echocardiography)	1	2	3	4	5
		Dr. Loui (Argument Games)	1	2	3	4	5
		Dr. Armbruster (MRI)	1	2	3	4	5
		Dr. Will (Einstein)	1	2	3	4	5
		Dr. Lehmkuhle (Vision and 3-D)	1	2	3	4	5
		Dr. Connett (Pi, etc.)	1	2	3	4	5
		Dr. Wysession (Plate Tectonics)	1	2	3	4	5
		Dr. Bellone (Molecular Biology)	1	2	3	4	5
		Dr. Fox (New Products)	1	2	3	4	5
		Dr. Marquis (Tropical Plants)	1	2	3	4	5
		Comments: _____					
10.	_____	Social Activities (Overall)	1	2	3	4	5
		Picnic at Shaw Park	1	2	3	4	5
		Observatory/Planetarium	1	2	3	4	5
		Baseball Night	1	2	3	4	5
		Pool Party	1	2	3	4	5
		Informal Student Interaction	1	2	3	4	5
		Overnight at Science Center	1	2	3	4	5
		Night at the Movie (Jurassic Park)	1	2	3	4	5
		Suggestions for Other? _____					
		Comments: _____					
11.	_____	Achievement Assessment (Overall)	1	2	3	4	5
		Written Research Paper	1	2	3	4	5
		Oral Presentation of Paper	1	2	3	4	5
		General Attitude & Behavior	1	2	3	4	5
		Peer Cooperation	1	2	3	4	5
		Pre & Post Test	1	2	3	4	5
		Comments: _____					
12.	_____	Collaborative	1	2	3	4	5
		Comments: _____					

13. If you had to pick two activities to drop from the program, which would they be?

A. _____ Why? _____

B. _____ Why? _____

14. If you could add any activity, what would it be?

_____

_____

15. For your own development and understanding, which activity was the most beneficial to you?

_____

_____

16. Considering the overall program, what would you change to make it better and why?

_____

_____

17. What is the most significant thing that you received from the Engelmann Institute?

_____

_____

18. The time schedule of events was . . .

_____ just about right.
_____ too free and open.
_____ packed too heavily.

Comments: _____

19. How was your perception of the University of Missouri-St. Louis changed after your Institute experience?

_____

_____

_____

_____

20. **To what degree would you be willing to recommend the Engelmann Institute to your friends?**

Not at All	0	1	2	3	4	5	6	To the Highest Degree

21. Would you like to see an extension of the Engelmann Institute into the school year when we would meet for science talks, social activities, etc.?

Yes _____; No _____; Maybe _____

If so, what would be the best days and times for you? Days _____, Time _____

How often would you like to meet? _____

Do you have suggestions for activities for this type of program? _____

_____

22. How would you rate the effectiveness of your research mentor?

Poor No Help	0	1	2	3	4	5	6	Outstanding. Extremely helpful and supportive.

23. Based on your expectations, how do you feel about your research work?

Depressed Poorest work of this type	0	1	2	3	4	5	6	Elated. Beyond what I thought I could do.

24. Overall the Engelmann Scholar Research Program was:

Weak and not worthwhile	0	1	2	3	4	5	6	Strongest such program in which I had participated.

25. What comments would you like to make regarding the Engelmann Institute Scholar Research Program?

_____

_____

THANK YOU VERY MUCH FOR YOUR HELP WITH THE EVALUATION. KEEP IN TOUCH WITH US AND LET US KNOW HOW YOU ARE DOING.
PLEASE RETURN TO:

Dr. Kenneth R. Mares
Engelmann Evaluation Project
239 Research
University of Missouri-St. Louis
8001 Natural Bridge Road
St. Louis, MO 63121-4499
Telephone: (314) 553-6155

The George Engelmann Mathematics and Science Institute
Research Scholar Program
Summer 1993

RESEARCH FACULTY MENTOR QUESTIONNAIRE

Mentor's Name: _____

Scholar's Name: _____

Directions: Please circle the rating (0 low to 6 high) that most clearly corresponds to your assessment regarding each evaluation criterion. Additional comments would be appreciated.

1. The degree of growth of your student's knowledge base in your area was:

   Non-existent 0 1 2 3 4 5 6 Very high

   Comments: _____

   _____

2. Student participation in the exploration of one or more research projects:

   No participation or involvement 0 1 2 3 4 5 6 Full participation as other students

   Comments: _____

   _____

3. Student participation in the day to day dynamics of the research environment:

   Not at all 0 1 2 3 4 5 6 Full participation as a integral part of the lab

   Comments: _____

   _____

4. The degree to which the student learned laboratory techniques, research methods, and the operations of technical equipment:

   No growth 0 1 2 3 4 5 6 Became proficient in methodologies

   Comments: _____

   _____

5. Was exposed to a variety of careers in science and technology:

Not at all 0 1 2 3 4 5 6 Has knowledge of a variety of opportunities

Comments: _____

_____

6. Understanding and demonstration of the preparation and presentation of formal scientific papers:

Very poor 0 1 2 3 4 5 6 Outstanding

Comments: _____

_____

7. Overall, how would you rate the experience of having a high school student in your laboratory as part of the Research Scholars' Program?

Very poor 0 1 2 3 4 5 6 Outstanding opportunity

Comments: _____

_____

8. Did the student perform as you expected? Yes._____ No. _____
If not, what is your perception?

_____

_____

9. Approximately how many hours per week did you actively spend with your student?

Less than 5_____ 5-10_____ 11-15_____ 16-20_____ More than 20_____

10. How many days were you away or otherwise unable to interact with the student?

0 day _____ 1-2 _____ 3-4 _____ 5-6 _____ More than 6 _____

11. Was six weeks a reasonable period to accomplish the goals of the program?
Yes_____ No_____

Comments:_____

_____

12. Was the current schedule acceptable to you? Yes _____ No _____
How would you change the schedule if you could?

Comments: _____

_____

13. What unusual or different activity did you do with your student that turned out to be very successful or helpful?

_____

_____

14. What did you feel was the greatest strength of the Research Scholars' Program?

_____

_____

15. What is the greatest weakness in the program?

_____

_____

16. Would more dialogue (during the program) between the program directors and mentors have been helpful? Yes _____ No _____

Comments:_____

_____

17. Does your student's research project have the potential to be entered into a science fair, Westinghouse, or Science, Engineering and Humanities Symposium Competition? Yes _____ No _____

18. Rate the potential of your student to complete a project for student competition like the science fair?

Success is unlikely	0	1	2	3	4	5	6	No doubt they will compete

Comments: _____

19. To what degree has your student grown over the six weeks with regard to objectives of the Scholar Research Program?

Little or no growth	0	1	2	3	4	5	6	High degree of positive change

Comments: _____

20. How would you rate the overall ability of your students with respect to other high school students or entering college freshmen?

_____Upper 50%; _____Upper 25%; _____Upper 10%

_____Upper 5%; _____Upper 2% _____Upper 1%

21. Please rank in order of importance to the success of the program all of the areas that your student has undertaken or accomplished: (1 = highest importance, 2 = second most important, etc.)

_____ Laboratory or research activity
_____ Science seminars
_____ Technical writing workshops
_____ Career confabs
_____ Social activities
_____ Writing the research paper
_____ Oral presentation
_____ Interactions with scientists & lab personnel
_____ Mentor-student social activities
_____ Attendance at a formal scientific presentation
_____ Preparation of a log book
_____ Other(s) (please list)

_____
_____

22. What is your overall rating of the Engelmann Scholar Research Program?

Poor should be dropped	0	1	2	3	4	5	6	Outstanding Effectively fills need.

23. Will you be willing to serve as a mentor next summer?

Yes _____, No _____, Maybe _____. If _____

_____

24. Please suggest colleagues whom you think may be particularly interested in participating next summer._____

25. Please feel free to make any additional comments or feel free to talk with us about any suggestions, or issues involving the Engelmann Scholar Research Program.

_____

_____

_____

_____

_____

Thank you very much for taking time to complete this questionnaire.

Please return to: Dr. Kenneth R. Mares
Engelmann Evaluation Project
239C Research
University of Missouri-St. Louis
8001 Natural Bridge Road
St. Louis, MO 63121-4499
(314) 553-6155

THE GEORGE ENGELMANN MATHEMATICS AND SCIENCE INSTITUTE PROGRAMS

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II
SCHOLAR RESEARCH PROGRAM

II
ACADEMIC YEAR PROGRAM

IV
COOPERATIVE FOR ADVANCED STANDING EXPERIENCE

V
COLLABORATIVE FOR APPLIED EXPERIENCES IN SCIENCE

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